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Brief notes are given on some diseases of broad beans in New South Wales. In most seasons, the chief causes of loss in this crop are [tomato] spotted wilt virus [*R.A.M.*, xix, p. 255] and rust (*Uromyces fabae*) [ibid., xx, p. 442]. Spotted wilt is most troublesome in mild winters and is most prevalent in urban areas, particularly in home gardens.

On young, vigorous broad bean plants the first symptoms appear as dark brown spots on the leaves, blighting and blackening of the young shoot, and dark brown streaks on the upper stem, often on one side only. The growing point of the shoot is often killed, but sometimes the plant partially recovers, producing small, pale leaves with light and normal green areas and margins that tend to roll upwards. Young pods present at the time of infection may develop black spots which become sunken pits, or such pods may become completely blackened. Young growth from the base of the plant is mottled, and the leaflets are small, with curled-up margins.

When more mature plants are affected, tip blight and the dark streaks on the stem may be absent, but new leaves formed after infection are mottled and the margins are curved up. The mottling may show no definite pattern, but occasionally round spots or vague concentric rings are visible. Affected plants should be removed and burnt.

Dusting with sulphur at weekly intervals assists in checking the spread of *U. fabae*. Chocolate spots are caused by *Ascochyta fabae* [ibid., xi, p. 143], and also by *Botrytis cinerea* [ibid., xxiii, p. 467], and root and crown rot by *Rhizoctonia* [*Corticium*] *solani* [ibid., xxii, p. 462; xxiii, p. 160]. Losses due to the last-named fungus are reduced by delaying sowing until the soil temperature has fallen (early April in coastal areas), seed-dusting with cuprox, oxycop, agrosan, or ceresan, and using a superphosphate fertilizer.

STOKER (G. L.). **Soil deficiencies as related to Sugar-Beet seed production in the Willamette Valley, Oregon.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 103–111, 1943.

Evidence is adduced that yellowing of sugar beets in the Willamette Valley, Oregon, may be caused by nitrogen deficiency, and the application of ammonium sulphate at the rate of 400 to 600 lb. per acre gave very promising results. The overhead sprinkling type of irrigation used provided a very easy and effective method of applying nitrogen to beets grown for seed when the plants were approaching the bloom stage.

In the autumn of 1939, agricultural sulphur was applied at the rate of 94 lb. per acre to a number of sugar beet plots. Both the sulphur and no-sulphur plots received three different nitrogen treatments, viz., 318 lb. sodium nitrate in autumn plus 330 lb. in spring, 333 lb. in autumn and 330 lb. in spring, and 100 lb. in autumn only. The following spring the plants in the sulphur plots grew vigorously, bolted uniformly, and had waxy green leaves, while those in the no-sulphur plots were

yellow and in a few cases showed white leaves. Yellowing was accompanied by breakdown of the leaf tissue, and leaf spot [*Cercospora beticola*] was very prevalent. As the season advanced, many leaves died. Numerous plants developed floral bracts and remained vegetative, retaining their yellowish-green colour until harvest. No response was obtained from sulphur when the spring nitrogen was omitted, and in the absence of nitrogen, the sulphur plots remained indistinguishable from the no-sulphur. The average yield of the sulphur and no-sulphur plots was, respectively, 1,578 and 1,235 lb. clean seed per acre.

Boron-deficiency symptoms were modified by winter temperatures, to which the plants were subjected by the over-wintering method of producing seed. Seed-stalk injury due to boron deficiency [*R.A.M.*, xx, p. 618] was first observed locally in the summer of 1938. In the winter of 1939–40, it was noted that the leaves of beet that received 30 lb. borax per acre before planting were a normal, green, whereas those that received no boron were severely frosted. Beets given lime but no boron showed the worst frost damage. As colder weather set in, other boron-deficiency symptoms appeared. The first were thickening, dwarfing, and crinkling of the leaves, which were very brittle. The petioles were short and often contained a rusty cross-checking on the concave side. Where the stand was thin, the leaves flattened out, giving the plants a rosette appearance. The tips of the youngest centre leaves turned black. Finally, the whole growing point died, and the outer, older leaves became badly frosted. During late winter or early spring new buds appeared on the crowns where the leaves had decomposed. The roots developed a discoloration and breakdown of the tissue immediately under the epidermis, which broke or rotted, leaving a reddish-brown decomposed material or canker area confined to the outer tissue.

In plants not given an application of borax in January, the upper part of the seed stalks developed a black discoloration in June, which arrested the terminal growth. Later, many plants made some recovery, secondary growth developing from the lateral buds below the injured area and forming a witches' broom. The tips of this secondary growth later turned brown to black.

Blackford (F. W.). **Sclerotinia or cottony rot.**—*Qd agric. J.*, liii, 3, pp. 161–163, 2 figs., 1944.

Lettuce, cabbage, French beans, passion fruit, and sunflower are the principal hosts of *Sclerotinia sclerotiorum* in Queensland [cf. *R.A.M.*, xxi, p. 440]. The sclerotia of the fungus are mainly responsible for the perpetuation of infection in Queensland. Their numbers in the soil may be reduced by the cultivation of resistant crops, such as tomato, potato, cucumber, or beetroot, in succession to one that has sustained heavy damage from the disease, while other precautions should include the choice of sunny, well-drained sites and reasonably wide spacing to promote air circulation. In small gardens, infected plants should be uprooted and burnt, and after harvesting a solution of 1 lb. copper sulphate in 7 gals. water should be applied to the soil at the rate of 2 gals. per sq. yd.

Giddings (N. J.). **Age of plants as a factor in resistance to curly top of Sugar Beets.** —*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 452–459, 4 graphs, 1943.

In an experiment carried out in 1939 at Riverside, California, plantings of the U.S. 22 variety of sugar beet (highly resistant to curly top) and the susceptible R and G Old Type were made on 20th January, 20th February, and 21st March. On 17th April, every alternate plot was inoculated with curly top by placing viruliferous leafhoppers on young leaves.

In both the inoculated and uninoculated plots of Old Type, the January planting showed greater curly-top resistance than the February planting, while the February planting was much more resistant than the March. No planting of Old Type

outgrew the disease within two months of inoculation. In the inoculated plots of U.S. 22, the January planting showed less curly top than the February, and both were much more resistant than the March. The inoculated plots of U.S. 22 showed very little disease and no difference in amount between the January and February plantings, but both were much more resistant than the March planting. U.S. 22 showed good ability to outgrow the disease, particularly in the March plantings.

In 1941, plantings of Improved U.S. 22 and Old Type varieties were made on 27th February and 22nd March, the inoculations being carried out on 24th April. In this case also the earlier plantings showed distinctly greater resistance than the later ones. It is concluded that, in general, early planting of sugar beets in curly-top areas is highly desirable.

Muncie (J. H.). **Dusting and spraying Sugar Beets in Michigan for control of Cercospora leafspot.**—*Proc. Amer. Soc. Sug. Beet Technol., 1942*, pp. 430–434, 1943.

In State-wide field-strip trials carried out in Michigan in 1941, sugar beet plots dusted against *Cercospora* [*beticola*] with bordow F–132, cuprocide 6-84-10, tribasic copper sulphate-talc-bentonite 14-71-15, and monohydrated copper sulphate-lime-pyrax 20-60-20 gave increased yields of 504, 451, 621, and 439 lb. recoverable sugar per acre, respectively, as compared with undusted plots, the differences required for significance at 5 per cent. level being 365, 411, 599, and 393 lb., respectively. No significant differences were noted between the mean yields of plots treated with the first three dusts.

Plots at Blissfield, Michigan, given applications of monohydrated copper sulphate-lime-pyrax 20-60-20, monohydrated copper sulphate-lime-eastern magnesia talc 20-60-20, and tribasic-eastern magnesia talc-bentonite 12-73-15 gave yields of 3,984, 3,401, and 3,514 lb. recoverable sugar per acre, respectively, compared with one of 2,839 lb. for the control, the differences being significant.

Spraying with Bordeaux mixture 8-4-100 and tribasic copper sulphate-lime 4-4-100 gave gross yields of 4,858·8 and 4,897·1 lb. compared with 4,030·3 for the control, both increases being significantly above the unsprayed plots, but the difference between the sugar yields of the sprayed plots was not significant.

Wallace (J. M.). **Acquired immunity from curly top in Tobacco and Tomato.**—*J. agric. Res.*, lxix, 5, pp. 187–214, 1 col. pl., 8 figs., 1944.

The experiments described in this paper preceded those discussed by Wallace and Lesley [*R.A.M.*, xxiii, p. 281]. Over a period of three years, 1939 to 1941, only one out of 800 plants of commercial tomato varieties recovered from artificial infection with beet curly-top virus, indicating that tomato plants do not acquire active immunity easily. When, on the other hand, tomato plants were grafted with Turkish tobacco scions in which recovery, or the reaction leading to recovery, had occurred, they acquired an immunity similar to the passive type observed in recovered tobacco plants. The retention of this acquired immunity in the tomato plants through many successive propagations suggested that an active process was in operation. In tests with a number of strains of curly-top virus it was shown that, depending upon the strain used, the protection afforded varied from complete to slight, the variation in vigour of plants and symptom manifestation being fairly consistent and apparently due to the virus strain rather than to individual plant reaction. Tomato clones immunized by single virus strains and then reinoculated with others displayed, both in the greenhouse and the field, a definite specificity of immunization, affording a high degree of protection against some strains and a lower one against others. The results demonstrate the operation of some kind of cross protection within tomato plants immunized against and carrying virulent strains of the virus, which differs from ordinary cross protection in that (1) the mild symptoms of the immunized plants are not due to the presence of a virus

strain of low virulence, and (2) the degree of protection varies with the virus strain used for the immunization of the plant and for the reinoculation. It is concluded from these studies that recovery and acquired immunity from curly top in tomato cannot be explained by strain antagonism or correlated with virus invasion of immature tissues; in both tobacco and tomato it appears to differ fundamentally from similar phenomena described for other plant viruses and to be closely comparable to reactions known for animal viruses.

Dillon Weston (W. A. R.). **Downy mildew of Sugar Beet.**—*J. Minist. Agric.*, li, 10, pp. 468–470, 1 fig., 1945.

This is a brief, popular note on the sugar beet downy mildew (*Peronospora schachtii*) and its control [cf. *R.A.M.*, xxiv, p. 105].

Price (W. C.). **Thermal inactivation of southern Bean mosaic virus.**—Abs. in *Amer. J. Bot.*, xxxi, 8, pp. 4s–5s, 1944.

When the numbers of lesions produced by southern bean mosaic virus [cf. *R.A.M.*, xxiii, pp. 203, 204] on Early Golden Cluster beans were plotted against time in minutes at a given temperature, the points obtained fell along a straight line, thermal inactivation of the virus at the given temperatures following a first-order reaction. The slopes of the lines give the inactivation rates. A study of these rates at temperatures from 65° to 95° C. at 5° intervals showed that the virus has a temperature co-efficient (Q_{10}) of about 3·1 and an energy of activation (E) of about 27,750 calories per mole, the corresponding values previously found for tobacco necrosis virus being 4·0 and 37,300 between 70° and 95° and for tobacco mosaic 9,500 and 195,000 between 83° and 95°.

White (N. H.) & Raphael (T. D.). **The reaction of green Pea varieties to downy mildew and two viruses.**—*Tasm. J. Agric.*, xv, 3, pp. 92–93, 97, 104, 1 fig., 1944.

In the 1943–4 trials at Summerleas Experimental Station, Tasmania, peas were affected by downy mildew (*Peronospora pisi*) [*R.A.M.*, xv, p. 194], the marble strain of common pea mosaic [ibid., xxiii, p. 85], and a virus disease resembling that due to the pea enation [mosaic] virus [ibid., xix, p. 561; xxiii, p. 166]. The peas were grown in three localities, and while all these diseases were present in each, their intensity varied.

Where moist, warm, sheltered conditions prevailed, downy mildew was very prevalent, but some varieties growing between heavily infected rows showed no symptoms. Mosaic incidence was very low; plants with well-marked symptoms were mostly isolated, the surrounding peas being unaffected. Enation mosaic, on the other hand, was widely distributed, and frequency was high. The varieties W. F. Massey, Radium, Perfection, and Perfection S.E.S.1 showed none of these three diseases. Observations suggested that the effects of enation mosaic and downy mildew upon pea yields may in certain circumstances be considerable.

Koehler (B.). **New developments in Soybean disease studies.**—*Soybean Dig.*, iv, 8, pp. 6–7, 3 figs., 1944.

Charcoal rot of soy-beans [*Macrophomina phaseoli*] has been observed to increase in prevalence towards the southerly range of the host, while sclerotial blight [*Sclerotium rolfsii*] is confined to the southern States of the American Union. At Stoneville, Mississippi, pod and stem blight [*Diaporthe phaseolorum* var. *sojae*] completely destroyed a field too early in the season for any of the plants to be harvested. The case was reported by J. A. Pinckard, Mississippi Agricultural Experiment Station, and the disease confirmed by W. B. Allington, U.S. Regional Soybean Laboratory. The risk of heavy losses through disease appears, in fact, to

be so great in the south as to preclude the large-scale extension of soy-bean cultivation.

In 1940 and 1941, soy-beans at the Illinois Agricultural Experiment Station were observed to be spotted and falling off in alarming numbers, and the causal agent was determined by R. W. Samson, of Purdue University, as the tobacco ring-spot virus. The same pathogen attacked soy-beans in an entirely different manner at the Iowa Agricultural Experiment Station in 1942, causing 'bud blight', external symptoms of which consist of dwarfing and curving of the youngest parts of the stems at the top or at the ends of the branches or both, and brown, necrotic, deformed areas on the leaves. W. B. Allington, who confirmed the responsibility of the ring-spot virus for both these manifestations, also pointed out another symptom, namely, brown, necrotic lesions in the interior of the stems, especially at their juncture with the leaf petioles. In the northern Mississippi Valley 'bud blight' appears to rival in importance the several bacterial blights, of which the most common in Illinois is bacterial pustule [*Xanthomonas phaseoli* var. *sojae*].

Co-operative seed-treatment tests have recently been carried out in Ohio, Illinois, Iowa, Missouri, Kansas, Nebraska, South Dakota, Minnesota, and Wisconsin with ceresan, semesan jr., fermate, spergon, and arasan. In the three northern States a Manchu type of soy-bean was used, and here spergon (3 oz. per bush.) gave the highest stand increases, with a maximum of 47·4 per cent. and an average for the three of 27·4 per cent. In the other six States the Lincoln variety was grown, and the best results were obtained with arasan (2 oz.), which resulted in an increase of 42·8 per cent. at the Ohio Station and an average of 17·7 per cent. for all locations. Only one of the seven test crops harvested (South Dakota) showed a significant increase of yield over the controls, so that no general recommendations in favour of seed treatment can yet be made on this basis.

In a series of tests by R. H. Porter, the emergence of the Mukden seed-type soy-bean was significantly benefited by seed treatment with spergon and arasan (1½ and 1 oz., respectively) in six out of 13 central and eastern States. Both these fungicides also gave satisfactory results, as regards stand and yield, in an independent trial by J. W. Heuberger and T. F. Manns at the Delaware Agricultural Experiment Station.

Obregón Botero (R.) & Otoya (F. J.). **Aspecto de la agricultura intensiva en la Provincia de Ocaña, Departamento Norte de Santander.** [A survey of the intensive agriculture in the Province of Ocaña, Northern Santander Department.]—*Rev. Fac. Agron., Medellin*, iv, 14–15, pp. 1645–1729, 21 figs., 1 diag., 1941. [Received November, 1944.]

Onions are one of the crops cultivated on a large scale in Ocaña, Northern Santander, Colombia, where the most important disease is purple blotch (*Macrosporium* [*Alternaria*] *porri*). Mildew (*Peronospora schleideni*) [*P. destructor*], 'enrollamiento' [leaf roll = ? yellow dwarf] (the first record for the country), white rot (*Sclerotium cepivorum*), and black mould (*Aspergillus niger*) were also observed. The slight increases in yield obtained by spraying with Bordeaux mixture and nicotine against purple blotch do not appear to justify the use of a fungicide, and directions are given for the control of the disease by sanitary measures, including the use of healthy seed, avoidance of excessive humidity (sparing irrigation), and crop rotation, e.g., with beans and groundnuts.

Green (D. E.). **A suspected virus disease of Shallots and Onions.**—*J. R. hort. Soc.*, lxx, 1, pp. 24–29, 4 figs. (between pp. 18–19), 1945.

Attention has already been drawn by Ogilvie and Walton to the occurrence of a disease presumed to be identical with yellow dwarf on shallots in England [*R.A.M.*,

xx, p. 442], and the writer has since observed it in a milder form on onions and leeks. On onions grown for seed the pale yellow to nearly white, broad stripes are most conspicuous on the flower stems, though they also appear on the leaves. As a rule, stunting of the flower stalk is not severe, but the seed weight is reduced and its vigour impaired. The foliage of autumn-sown plants shows a yellowish streaking, accompanied by some degree of crinkling, general pallor, and limpness, similar but less pronounced symptoms being characteristic of affected spring-sown onions. Yellowish stripes of varying width also develop on leek leaves. In a test at the Royal Horticultural Society's Garden, Wisley, Surrey, in 1943, the average weights of 50 sound and diseased mother shallot bulbs planted on 2nd February were 9·8 and 6 gm., respectively, and those of the progeny lifted on 8th August 57 and 17·5 gm., respectively. Pending further studies on the identity of the disease, which is similar in its symptoms to yellow dwarf, growers are advised to locate their seed-onion plots at a distance from striped shallots or onions.

Stubbs (L. L.) & Grieve (B. J.). **A new virus disease of Carrots.**—*J. Dep. Agric. Vict.*, xlii, 9, pp. 411–412, 415, 6 figs., 1944.

Carrots in the Melbourne market-garden area and, during the last two years, in the newly developed carrot-growing areas of Gippsland and the Western District of Victoria, have become affected by a disease the severity of which is such that successful crops of the usual commercial varieties can now be grown only in summer.

The first symptom on young plants at the 3 to 4 fern-leaf stage is a reduction in length and a slight twisting of the petiole of the leaf which emerges immediately after infection. The individual leaflets which appear subsequently are reduced in size. A chlorotic condition (almost a mosaic of light and dark green areas) next appears on the leaves; the leaf petioles become twisted, and the plant remains stunted and fails to produce marketable roots.

Plants in an intermediate stage of development show stunting of the leaves; the petioles and subpetioles are often twisted, and those of the older leaves are sometimes S-shaped, or bent backwards so that the under surfaces of the leaves fall upwards. The groove along the petiole of twisted leaves is thrown into relief. Individual leaflets are twisted, distorted, and small. The outer leaves show an irregular chlorotic mottle, which is replaced by a marginal chlorosis, this in turn giving way to marginal reddening. The inner leaves show some chlorosis.

On plants approaching maturity, the petioles of leaves emerging immediately after infection are distorted, twisted, and shortened, so that the inner leaves have a rosette appearance. The petioles of these leaves are brittle, and sometimes show brown, necrotic streaks. Outer leaves developed before infection usually remain unaffected.

Experimental evidence demonstrated that the disease is transmitted by a common aphid pest of carrots provisionally identified as *Cavariella aegopodii scopoli*. It was also ascertained that *Salix vitellina*, a host on which this insect is often found, is not susceptible to the disease, and that ability to transfer infection is not heritable in the progeny of originally infective aphids.

In field tests, the following varieties were susceptible: Chantnay, Danners Half Long, Hutchinson's Imperator, Nantes, Morse's Bunching, Oxheart, and Short Horn. A variety commonly referred to in Victoria as West Australian (synonyms, Osborne Park, Champion Long Red, Champion Intermediate), and a Victorian grower's selection of a similar type were found to be highly tolerant. This virus appears to be a new record.

Ramsey (G. B.) & Smith (M. A.). **Orange rust a market factor in Colorado Spinach.** —*Plant Dis. Reptr*, xxviii, 29, pp. 911–912, 1944. [Mimeographed.]

Spinach rust (*Puccinia aristidae*, syn. *P. subnitens*) has not assumed an econo-

mically important form in the United States since 1922 [*R.A.M.*, ii, p. 100]. In 1943 and 1944, however, it seriously damaged market crops, both of the flat and curly types, on the river bottom land of the Denver district of Colorado, where the alternate uredo and teleuto phase occurs on salt grass (*Distichlis stricta*). In some fields the severe spotting of the leaves on 50 to 90 per cent. of the plants necessitated the ploughing-up of the stands. The pale yellowish-green spots, 1 to 2 mm. in diameter, are most prominent on the under sides and rapidly expand, the aecidia with their bright orange spores being conspicuous in the centres at an advanced stage of infection.

Cooper (R. F. V.). **Mancha foliar del Apio o 'ceniza' (Septoria apii y Septoria apii-graveolentis).** [Leaf spot or 'ashes' of Celery (*Septoria apii* and *Septoria apii-graveolentis*).]—*Rev. B.A.P.*, xxvii, 320, pp. 55–57, 1 fig., 1944.

This is a popular note on the celery leaf spots caused by *Septoria apii* and *S. apii-graveolentis*, which have assumed an exceptionally severe form in Mendoza, Argentina [*R.A.M.*, xx, pp. 9, 511], owing to the abnormally heavy precipitation of 1943 and 1944. No original work on the control of the pathogens has yet been published in Argentina, but seed treatment with mercuric chloride and spraying the crop with Bordeaux mixture are recommended.

Thompson (R. C.), Doolittle (S. P.), & Smith (F. F.). **Investigations on the transmission of big vein of Lettuce.**—*Phytopathology*, xxxiv, 10, pp. 900–904, 1944.

Big vein of lettuce [*R.A.M.*, xxii, p. 209] was conclusively proved by experiments at the Plant Industry Station, Beltsville, Maryland, to be soil-borne, its agent being inactivable by three hours' steam sterilization at 10 lb. pressure as reported by Jagger and Chandler [ibid., xiv, p. 283]. The symptoms of the disease did not appear in any of the plants until they had been growing for five weeks in infested soil, and in some cases a period of up to 127 days elapsed before external signs of the disorder were noticed. Negative results were given by mechanical inoculation tests, while the preliminary trials with insects do not as yet justify a positive conclusion, though there are indications that the root aphid, *Pemphigus lactucae*, may serve as a vector of big vein.

Blackford (F. W.). **Downy mildew and Septoria leaf spot of Lettuce.**—*Qd agric. J.*, lix, 4, pp. 221–223, 2 figs., 1944.

Lettuce downy mildew (*Bremia lactucae*) [*R.A.M.*, xxiii, p. 55] is of frequent occurrence in Queensland, where, however, it only occasionally causes serious damage. It is most prevalent in winter and spring, and spreads very rapidly when cool, moist conditions obtain in overcrowded or shaded seed-beds. Control is materially assisted by sparse sowing and by thinning out the plants as early as possible. If the lettuces are kept healthy in the early stages of growth, very little trouble should be experienced later. If previous crops have been affected, the lettuces should be sprayed once or twice with Bordeaux mixture (3–2–40) or home-made cuprous oxide (3–40); the first treatment should be applied shortly after the first true leaves have formed, and the second about a week later. If transplanting is to be effected, spraying should be completed three or four days beforehand.

Very few plantings are free from leaf spot (*Septoria lactucae*) [ibid., xx, p. 193]. Infection is generally present, even in the healthiest plantings, on the lower leaves of some plants, but as these leaves usually die before the plant is picked or are removed before packing, the condition is of no importance. When infection is found on the leaves of the marketable head or is well established on half-developed plants, it is probable that the plants have suffered some check to their growth,

which has permitted the fungus to pass farther up the stalk than is normally the case. If the disease has developed extensively, growers should search for possible causes of a check to growth and eliminate these factors.

BENNETT (C. W.). **Studies of Dodder transmission of plant viruses.**—*Phytopathology*, xxxiv, 10, pp. 905–932, 3 figs., 1944.

In experiments at the Sugar Plant Field Laboratory, Riverside, California, three species of dodder, *Cuscuta subinclusa*, *C. campestris*, and *C. californica*, were tested for their ability to transmit 12 viruses from diseased to healthy plants. All three species conveyed dodder latent mosaic [*R.A.M.*, xxiii, p. 248] and cucumber mosaic to high percentages (up to 100) of the inoculated plants, while sugar beet curly top and tomato spotted wilt were transmitted to smaller numbers. Mustard (*Brassica adpressa*) mosaic (probably related to mild mosaic of annual stock [*Matthiola incana* var. *annua*: ibid., xviii, p. 459]) was transmitted to a high proportion of inoculated plants by *C. californica*, the other two dodders being less effective. *C. californica* was also the only one of the three species to communicate tobacco etch from infected to healthy Turkish tobacco plants. On the other hand, it failed to transmit tobacco mosaic to the same host, while the other two dodders were able to infect a small percentage. None of the dodders proved capable of transmitting the viruses of sugar beet mosaic, sugar beet yellow vein, tomato ring spot, citrus psorosis, or peach mosaic.

In tests to determine the longevity of viruses in dodder growing on non-infected hosts, the cucumber and dodder latent mosaic viruses were active in the three species after periods of one to four months, whereas ten days was the maximum for the recovery of beet curly top. The mustard mosaic virus was still operative in *C. californica* after 20 but not after 40 days, while that of tobacco etch persisted in the same species of dodder for periods of two to four weeks.

The dodder latent mosaic virus was transmitted through 2·4 and 4·9 per cent., respectively, of the seeds of *C. californica* and *C. campestris*, and was active in those of the latter species after one year's storage.

The movement of the beet curly-top and cucumber mosaic viruses in dodder stems was much more rapid towards the growing points and away from the host than in the opposite direction. Growth of dodder on one shoot of beet plants with three shoots on a single root system induced migration of the curly-top virus from an inoculated shoot in periods of 32 to 46 days, whereas control shoots remained free of symptoms for 113 to 149 days. The tracheal elements of dodder unite directly with those of the host through the haustorium, while food materials evidently pass rapidly through the cells connecting the phloem of the parasite with that of the host. The walls of some of the exterior haustorial cells are traversed by lines that appear to be plasmodesmata and may be joined to similar lines in the walls of adjacent host cells.

In conclusion, the mechanism by which a virus is picked up by dodder and passed on to the host is discussed.

MCKINNEY (H. H.). **Descriptions and revisions of several species of viruses in the genera Marmor, Fractilinea, and Galla.**—*J. Wash. Acad. Sci.*, xxxiv, 10, pp. 322–329, 1944.

In this paper the author describes and gives Latin names to several species and varieties of viruses infecting cereal and forage grasses, including the following: *Marmor tritici* var. *typicum* var.nov. for the wheat mosaic-rosette virus; *M. tritici* var. *fulvum* var.nov. for the prairie wheat yellow mosaic virus; *Marmor anularium* nom.nov. for the tobacco ring-spot virus; *M. constans* n.sp. for the virus inducing mild, dark green mosaic in tobacco; *Fractilinea tritici* n.sp. for the Russian wheat mosaic virus; *F. avenae* n.sp. for the Siberian oat mosaic virus (zakooklivanie

[pseudorosette]); and *Galla zeae* n.sp. for the wallaby ear disease of maize. The descriptions cover host reactions, transmission, mutation, physical properties, and geographical distribution. There is a bibliography of 37 titles.

Ryjkoff (V. L.). Основы учения о вирусных болезнях растений. (Общее учение о вирусах). [Basic theories of plant virus diseases. (General theory of viruses).].—224 pp., 39 figs., 3 graphs, Moscow-Leningrad, Acad. Sci. U.S.S.R., 1944.

In this book on virus diseases of plants the author summarizes all available knowledge on the subject in 12 chapters which fall roughly into three parts: the first deals with the nature of viruses, the second gives descriptions of various diseases and their control, and the third discusses the methods of studying viruses and virus diseases. A list of viruses based on K. M. Smith's system of nomenclature, with synonyms, and a 12-page bibliography are appended.

Bawden (F. C.). **Plant viruses and virus diseases.** Second Edition.—294 pp., 39 figs., 4 diags., 6 graphs, Waltham, Mass., U.S.A., The Chronica Botanica Company; London, W. 1, Wm. Dawson & Sons Ltd., 1943. $4.75.

Nothwithstanding the difficulties arising from war conditions, considerable progress has been made in the study of plant viruses and their associated diseases since the publication of the first edition of this useful treatise in 1939 [*R.A.M.*, xviii, p. 756]. The most extensive alterations in the present edition have been needed in the chapters dealing with the properties of viruses *in vitro* and their relationships with their insect vectors, in which field knowledge has advanced most rapidly. Some of the many controversial problems still at issue in 1939 have been resolved and could therefore be more briefly dealt with; in particular, the view that the specific proteins isolated from diseased plants are actually identical with the viruses themselves has found general acceptance. Little is yet known, however, of the behaviour of viruses in their natural habitat within the host, and it is this aspect of the subject on which attention should now be mainly focused.

Harris (R. V.). **Plant pathology.**—*Rep. E. Malling Res. Sta., 1943*, pp. 23–25, 1944.

A sample of one of the most promising East Malling raspberry seedlings was found to be entirely virus-free, while three others were highly infected with and tolerant of mosaic 2 [cf. *R.A.M.*, xx, p. 69]. The leaf curl disease affecting Norfolk Giant raspberries in Scotland [ibid., xxii, p. 441] was shown to be graft-transmissible. Observations suggested that local stocks of the Lloyd George variety may provide a major source of infection of Norfolk Giant. The disease appears to resemble closely the leaf curl disease of raspberry present in North America, particularly yellow blotch curl [ibid., xvii, p. 537]. Outside the area affected in Scotland no outbreaks were observed, except for leaf blotch symptoms on a wilding near London and on a seedling variety at East Malling.

Evidence that strawberry yellow edge [ibid., xxii, p. 240] and crinkle [ibid., xxii, p. 32] are due to virus complexes is accumulating, and it is believed that four distinct viruses have been isolated.

Cultural and pathogenicity studies of various strains of *Verticillium* from hop plants failed to reveal any differences between isolates from 'progressive' and 'fluctuating' outbreaks, respectively. They also supported the view that specific rank should be given to isolates provisionally referred, on morphological and physiological grounds, to *V. dahliae*, *V. albo-atrum*, and *V. nigrescens*.

Wiehe (P. O.). **Division of Plant Pathology.**—*Rep. Dep. Agric. Mauritius, 1943*, pp. 9–10, 1944.

In this report [cf. *R.A.M.*, xxiii, p. 252] it is stated that during the winter of

1943, cassava plantations in Mauritius were slightly attacked by *Gloeosporium manihotis* [ibid., xx, p. 564]. A serious disease of sweet potato of the anthracnose type, due to a species of *Colletotrichum*, occurred in one locality, where it destroyed about 100 acres of the crop, planted at different times; the condition has not previously been recorded in the island. A storage rot of the same host was found to be due to a species of *Rhizopus*.

Fifty-sixth Annual Report of the Rhode Island State College Experiment Station.—46 pp., 1944.

In this report on plant disease work in Rhode Island during 1943 [cf. *R.A.M.*, xviii, p. 727] it is stated that in that year one of the worst epidemics of apple scab [*Venturia inaequalis*] within memory was experienced. Unsprayed susceptible varieties showed up to 100 per cent. foliage infection and matured no fruit. Severely infected trees had lost 50 to 75 per cent. of their leaves by 1st September, and even trees carefully sprayed with the standard sulphur sprays sustained considerable foliage and fruit infection. The asci developed in the wet, overwintered leaves during the first two weeks in May until 95 per cent. were mature, but apparently no spores were discharged. Then, during the rainy period of 17th to 21st May, when the McIntosh blossoms were wide open, 95 per cent. of the ascospores were discharged, and by 1st June discharge was complete.

In greenhouse tests, Baldwin leaves sprayed with fermate [ibid., xxii, p. 261] (1½ lb. per 100 gals. water plus 1½ lb. fresh hydrated lime) showed some browning when the spray was applied at 90° or over, but no visible injury at 55° to 85°. A reduction in photosynthetic activity of from 2 to 20 per cent. occurred. With the fungicide Q1 (used at 1 in 5,000) no visible injury was observed, photosynthesis being reduced by 16 and 3 per cent. at 95° and 77°, respectively. Both materials may be used with reasonable safety so far as their effect on the food-manufacturing activity of apple leaves is concerned; application when the temperature is low appears to be desirable.

In a limited test on mature apple trees with an average yield of 29 bush. each, fermate used according to the manufacturers' directions caused no leaf injury. It gave 12 per cent. fruit scab, as against 17 per cent. for flotation sulphur (10 lb. per 100 gals.). There was no difference in russeting tendencies between the two materials. Fermate would appear to merit limited trials.

A new fungicide, puratized N5X, stated to be inexpensive, compatible with insecticides, non-injurious to foliage and fruit, equally potent in acid or alkaline water, and effective against scab at dilutions of 1 in 5,000 to 1 in 10,000, gave outstanding results in a comparative test of seven fungicides on the McIntosh and Baldwin apples. The next best was isothan Q4, which also had contact value against aphids. Camden paste sulphur (wettable sulphur) and fermate came third and fourth, respectively. Observations on 9th to 12th July showed that Camden paste allowed 59 per cent. of the McIntosh spur leaves to become infected and fermate 61 per cent. The combined fermate-lime spray caused marked necrotic flecking on 60 per cent. of the Baldwin foliage. If the striking control of scab given by puratized N5X and isothan Q4 is repeated, growers may profitably change to these materials in 1945.

An orchard of 400 McIntosh and Baldwin trees planted in 1939 was divided into five plots each of five trees of each variety and sprayed at the usual times (five applications) with lime-sulphur 1 in 50 (day), the same (evening), lime-sulphur 1 in 100 (day), lime-sulphur 1 in 50 (two applications) followed by flotation sulphur paste 10 lb. to 100 gals., lime-sulphur 1 in 50 (two applications) followed by kolofog 6 lb. to 100 gals., flotation sulphur paste 10 lb. to 100 gals., sulphur dust, and control. After five years, trunk diameter used as an index of total growth showed a marked varietal response to disease control and to spray injury. With the McIntosh

trees, all the treatments except lime-sulphur 1 in 50 gave significantly better results than did no treatment. Flotation sulphur, sulphur dust, and lime-sulphur 1 in 100 were significantly better than lime-sulphur 1 in 50 used throughout the season. Lime-sulphur followed by flotation sulphur or kolofog gave better growth than lime-sulphur applied throughout the season. With the resistant Baldwin, the unsprayed trees were significantly better than those sprayed with lime-sulphur 1 in 50, day or evening, throughout the season. The same held true for all other treatments except that there was no statistically significant difference between the control and any mild sulphur treatment. It seems that with Baldwin trees very little fungicide need be applied during the first five years in the orchard. A dust or wettable sulphur programme is recommended for McIntosh.

Preliminary experiments with brytene wax markedly reduced Jonathan spot on Jonathan apples. The more concentrated the wax emulsion used, the more complete was the control that resulted. Thus, brytene 489A 3·7, 6·5, and 26 per cent. gave, respectively, 3, 10, and 23 clean 18, 10, and 5 severely spotted fruits, and brytene 333-B 3, 6, and 24 per cent., 2, 14, and 20 clean fruits and 16, 6, and 3 severely spotted ones, respectively, as against only one clean fruit and 22 severely spotted ones in the controls.

For the third year in succession, dipping potato seed in mercury solutions, including semesan bel, retarded the early development of the plants, without giving any significant freedom from scab [*Actinomyces scabies*] or *Rhizoctonia* [*Corticium solani*], or any increase in yield. The results clearly indicated that early-harvested varieties, such as Cobbler, may be checked, not benefited, by seed treatment with mercuric chloride or yellow oxide of mercury. Fermate and isothan DL1, however, appeared to stimulate growth, the shoots emerging more quickly and blossoming occurring earlier when the seed was treated with these materials. Isothan DL1 gave the best yield.

Experimental evidence indicated that the cost of protecting potato foliage against late blight [*Phytophthora infestans*] during a dry season may be as high as 56 per cent. of the crop, if eight applications of Bordeaux mixture are made. The foliage of the sprayed plants remained green longer than that of the unsprayed, but the treated plants produced fewer tubers. However, in cool, rainy seasons Bordeaux mixture should be used.

Tests demonstrated that isothan Q4 (lauryl pyridinium bromide), isothan Q14 (lauryl quinolinium bromide), and isothan Q15 (lauryl iso-quinolinium bromide), when present at a concentration of five parts per million of water, kill pathogenic mould spores. They may safely be used on potato foliage, since injury begins when concentrations of 1 in 1,000 or more are used, and those of 1 in 5,000 to 1 in 10,000 are enough to control diseases. The property they possess of spreading over surfaces in droplets of water greatly enhances their fungicidal, bactericidal, and insecticidal value.

A second promising group of pesticidal compounds occurs among the quaternary ammonium compounds. It has been found possible to alter the toxicity to bacteria and fungi, injuriousness to vegetation, solubility in water, and wetting ability of these materials by changing the structure of the molecule. Among these chemicals are imularv, quartol, ammonyx Q, and isothan DL1. The inherent wetting action of the last named puts it in a class by itself. At dilutions of 30 parts per million it causes sprays to form a continuous film on plant surfaces.

A third group of chemicals investigated as potential fungicides consisted of a new type of organic mercury compounds. The best was puratized N5X [see above], which is used as a mildew-proofing agent on textiles [ibid., xxiii, p. 310]. In standard laboratory tests this material prevented the germination of more than 95 per cent. of the spores of *Macrosporium* [*Stemphylium*] *sarciniforme* at a dilution of three parts per million of water.

Frampton (V. L.) & Hildebrand (E. M.). **Electrokinetic studies on Erwinia amylovora and Phytomonas stewartii in relation to virulence.**—*J. Bact.*, xlviii, 5, pp. 537–545, 1 graph, 1944.

No correlation was detected between the pathogenicity of *Erwinia amylovora* and *Phytomonas* [*Xanthomonas*] *stewarti*, the agents of pear fireblight and maize wilt, respectively, and their electrophoretic velocity, but the mobility-P_H curves at constant ionic strength appeared to be distinctive for each species. The mobility of *E. amylovora* was not affected by age, storage, kind of media, or serum globulin.

Brown (J. G.) & Boyle (Alice M.). **Penicillin treatment of crown gall.**—*Science*, N. S., c, 2606, p. 528, 1944.

Crown galls of the soft type induced in *Bryophyllum* sp. by hypodermic inoculations with a pure culture of *Agrobacterium* [*Bacterium*] *tumefaciens* were cured by crude penicillin produced in the author's laboratory from an improved strain of *Penicillium notatum* [cf. *R.A.M.*, xxiv, p. 52]. The procedure adopted consisted in wrapping penicillin-soaked antiseptic cotton round the galls, frequently damping the cotton with crude penicillin, and puncturing the gall under the wrapping in numerous places with a sterile needle. Complete destruction of the galls resulted.

Posnette (A. F.). **Virus diseases of Cacao in Trinidad.**—*Proc. agric. Soc. Trin. Tob.*, xliv, 3, pp. 191–195, 3 figs., 1 diag., 1944.

This is a reprint of a paper already noticed from another source [*R.A.M.*, xxiii, p. 379].

Pound (F. J.). **Government's scheme for Cacao rehabilitation.**—*Proc. agric. Soc. Trin. Tob.*, xliv, 3, pp. 183–189, 1944.

In this interesting survey of the progress made in the scheme for the rehabilitation of cacao in Trinidad the author states that some of the seedlings obtained from seeds sent from the Amazon Valley in 1938, have so far shown no infection by witches' broom [*Marasmius perniciosus*: *R.A.M.*, xix, p. 391]. The best clone of two trees produced 130 pods in 1943, with no brooms as yet. In 1943, the author brought to Trinidad three budded plants of each of 32 trees found free from infection in the Amazon Valley [ibid., xxiii, p. 56]. These are now well established at River Estate. Some of the parent trees were free from disease in 1938, 1940, and 1942. The progeny have shown no sign of infection. Others were located in 1943, and three have had one small broom each; this, however, may be a juvenile character, and only temporary. Until the tests of the Amazon material have been completed, the only plants issued to planters will be susceptible but high-yielding selections; these must be planted only in suitable areas and not in those scheduled for a resistant cacao only.

Nosti (J.). **La utilización de Heveas empleadas como árboles de sombra.** [The utilization of *Hevea* trees for the provision of shade.]—*Bol. agric. Terr. esp. Golfo de Guinea, 1943*, Part I, pp. 7–25, 2 pl., [? 1943. Received February, 1945.]

The most serious disease of *Hevea* rubber on the island of Fernando Po, where the tree is grown exclusively to provide shade in cacao plantations, is the root rot caused by *Fomes lignosus*. The fungus spreads from rubber to cacao and coffee in the vicinity and destroys them within a maximum period of two years. Other local hosts of the pathogen include bread fruit [*Artocarpus integer*], coco-nut, *Yucca*, and *Erythrina* spp.

Reports on diseases of cereal crops and grasses.—*Plant Dis. Reptr*, xxviii, 22, pp. 704–712, 1944. [Mimeographed.]

These reports and others in the same and subsequent issues contain numerous records of plant diseases occurring in the United States.

Straib (W.) & Noll (A.). **Untersuchungen über den Einfluss der Hitze auf den Rostparasitismus.** [Investigations on the influence of heat on rust parasitism.] *Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 257–277, 1944.

In continuation of previous studies on the influence of temperature on rust parasitism, the authors investigated the effect of supramaximal temperatures on the course of infection and the external and histological reactions of wheat plants to yellow and brown rusts (*Puccinia glumarum* and *P. triticina*) [*R.A.M.*, xxii, p. 129]. The treatment consisted in the immersion of the plants for varying periods up to 24 hours in water heated to temperatures ranging from 25° to 50° C.

The outward manifestations of resistance, i.e., chlorosis and necrosis, increased in intensity with rising temperatures up to 35° in susceptible varieties immersed for uniform periods a few days after inoculation and then decreased. This response was induced after treatment for 16 hours, two hours, and one second at 25°, 30°, and 50°, respectively, while the fructification of both rusts was completely suppressed by immersion for 15 hours at 30°, ten minutes at 40°, and five seconds at 50° when the treatment was given five days after inoculation; with an earlier commencement these periods were correspondingly reduced. Heating of the wheat leaves before inoculation induced a temporary enhancement of susceptibility to both rusts, especially in such highly resistant varieties as Malakoff (to *P. triticina*) and Heine's Kolben and Carina (to *P. glumarum*), the most pronounced effects being obtained by 40 seconds' immersion at 50°.

High-temperature treatment of the plants after the establishment of rust infection causes the production of a wound gum-like substance round the mycelia [ibid., xxiii, p. 58 and next abstract], while another accompaniment of induced resistance is an incrustation of the host tissues with silicic acid. The adverse effects of heat on the pathogens are reflected in an inhibition of hyphal growth and deformation of the haustoria. A comparison of the microscopic features of *P. glumarum* and the cells of its host in cases of the so-called 'summer' or 'field' resistance revealed close analogies with those of the rust in seedlings with acquired resistance from heat 'shock'.

Noll (A.). **Untersuchungen über Wundreaktionen des Weizenblattes und ihre Beziehungen zur Rostinfektion.** [Investigations on wound reactions of the Wheat leaf and their relations to rust infection.] *Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 277–285, 1944.

The production in wheat leaf wounds of a substance resembling wound gum [see preceding abstract] is strongly favoured by a high degree of atmospheric humidity. At the optimum temperature of 30° C. the process is accomplished in 10 to 12 hours. The gum may be formed by the host cells in response to bacterial infection through an injury; after 20 seconds' heating at 50° it is no longer secreted and decay of the tissues sets in at the site of the wound. Wound gum production is further prevented by various other factors, such as frost, chloroform vapours, and infection by yellow rust (*Puccinia glumarum*). The cells in the vicinity of the injury are heavily incrusted with silicic acid. A number of analogies were observed to exist between the above-mentioned reactions of the host to injury and those developing as a sequel to rust infection, notably in respect of their relations to temperature.

Hart (Helen). **Stem rust on new Wheat varieties and hybrids.**—*Phytopathology*, xxxiv, 10, pp. 884–899, 4 figs., 1944.

Between 1939 and 1943 many of the wheat varieties and hybrids resistant to

stem [black] rust (*Puccinia graminis tritici*), which have been bred and distributed in increasing numbers in the United States since 1925, were grown at the Minnesota Agricultural Experiment Station to determine their capacity to withstand early and heavy inoculation with the parasite under variable environmental conditions. The test plots were surrounded by the susceptible Hard Federation variety, and the inoculum consisted mainly of physiologic races 10, 11, 15, 17, 21, 34, 36, 38, 49, 56, and 147. The experimental results are tabulated and discussed in the light of contemporary studies on varietal reaction to *P. g. tritici* and physiologic specialization within the rust.

Race 15B of *P. graminis* was identified in several collections from different parts of the United States. This race, though not one of the most prevalent, is particularly dangerous to most of the varieties and hybrids being bred for the Mississippi Valley, where the spring wheat varieties resistant to the now prevalent races are also susceptible to race 15B. Many of the breeding materials, such as Hope, the Kenya wheats, Jumillo durum, Vernal Emmer, and *Triticum timopheevi* are highly susceptible to race 15B, and most of the few wheats resistant to this race have certain undesirable characters, so that if the increased use of susceptible varieties should result in an increase in inoculum of race 15B the position might become serious.

CRAIGIE (J. H.). **Increase in production and value of the Wheat crop in Manitoba and Eastern Saskatchewan as a result of the introduction of rust resistant varieties.**—*Sci. Agric.*, xxv, 2, pp. 51–64, 1 map, 1944.

The benefit accruing to agriculture from the application of scientific research is vividly exemplified by the introduction of rust-resistant wheats in Canada. The bulk of the loss from stem rust [*Puccinia graminis*] in Western Canada has occurred in Manitoba and eastern Saskatchewan, but substantial loss has also occurred in occasional years in western Saskatchewan and Alberta. In the eleven-year period from 1925 to 1935 the average annual loss in the two first-named provinces of 35,518,000 bush. is estimated to have had a cash value of $30,784,000. In the epidemic year, 1916, the loss of yield in western Canada amounted to 100,000,000 bush. This loss in yield is not the whole loss. The grade of the crop is lowered by the rust. In 1916 this additional loss was about $64,000,000. The whole loss to western Canada from stem rust in that year is conservatively estimated at over $200,000,000. The growing of rust-resistant wheats began to influence wheat production in 1938 or 1939. In the next six years the farm income of Manitoba rose by about $9,500,000 a year and that of eastern Saskatchewan by $17,500,000 a year. This is not all. Besides attacking wheat, wheat stem rust attacks barley and it has been noticed that a great deal less infection develops on barley than was the case before rust-resistant wheats were introduced, owing to the amount of inoculum being greatly reduced. Some of these stem rust-resisting wheats are very susceptible to leaf rust [*P. triticina*], and a further, though not so large, gain would accrue if all the varieties grown were resistant to leaf rust as well as to stem rust. It is not only financially that the community is benefited, but there is also relief from one of those uncertainties which have the effect of frustration and insecurity.

Before 1916 apparently no money was spent on rust research and it is safe to say that the total amount spent since by the Government and all organizations does not exceed $2,000,000 and was probably much less. So that in a single year the improvement of farm income in the two areas mentioned exceeds 13 times all the expenditure ever made by Canada on wheat rust research. There is still scope for profitable expenditure. For example, rust-resistant varieties of barley should be developed. If Canada is to compete successfully as an exporter of farm products costs must be reduced, and this can only be done by scientific research.

Gordon (W. L.). **The occurrence of Fusarium species in Canada I. Species of Fusarium isolated from farm samples of cereal seed in Manitoba.**—*Canad. J. Res.*, Sect. C, xxii, 6, pp. 282–286, 1944.

During the six years, 1937 to 1942, isolations from 1,448 farm samples of seed of common wheat, 262 of durum wheat, 865 of barley, and 519 of oats produced in Manitoba yielded a total of 16 species, varieties, or forms of *Fusarium* [*R.A.M.*, xx, p. 353] representing seven sections of the genus. The most prevalent were *F. poae*, *F. equiseti*, and *F. scirpi* var. *acuminatum*; these three and *F. avenaceum*, *F. semitectum* var. *majus*, *F. culmorum*, *F. graminearum* [*Gibberella saubinetii*], and *F. oxysporum* were isolated from all four crops; *F. scirpi*, *F. sambucinum*, and *F. moniliforme* [*G. fujikuroi*] from common wheat, barley, and oats; *F. sporotrichoides* from common wheat and barley; *F. sambucinum* form 1 from common wheat and oats; *F. concolor* from barley; *F. scirpi* var. *compactum* from common wheat; and *F. sambucinum* form 6 from durum wheat. Species of *Fusarium*, one or more, were isolated from approximately 39 per cent. of the samples of common wheat, 38 per cent. of durum wheat, 55 per cent. of barley, and 58 per cent. of oats, but they were present only in small numbers in the seeds of each sample, e.g., in 0·66 per cent. of common wheat, 0·51 per cent. of durum wheat, 1·23 per cent. of barley, and 2·21 per cent. of oats. Individual species, varieties, or strains of *Fusarium* were isolated from less than 1 per cent. of the seeds of the four crops, with the exception of *F. poae*, which was isolated from 1·79 per cent. of the seeds of oats.

Oxley (T. A.) & Jones (J. D.). **Apparent respiration of Wheat grains and its relation to a fungal mycelium beneath the epidermis.**—*Nature, Lond.*, cliv, 3922, pp. 826–827, 1944.

In studies conducted at Slough, respiration measurements made on wheat grain stored at 25° C. showed a progressive increase in the rate of carbon dioxide output over a period of several months, suggesting a progressive development of actively respiring tissue. As it has not been possible to detect any corresponding increase in the size or differentiation of the wheat embryo, it was concluded that the increased respiration rate of the grain is due almost entirely to micro-organisms which infect it. It was demonstrated that the carbon dioxide produced by the grain originates largely in the pericarp which contains few, if any, actively developing or even living cells, but was shown to contain abundant mycelium on the inner surface of the epidermis. The authors have so far been unable to identify any of the organisms present or to isolate them free from contamination. Further studies are stated to be in progress.

Tapke (V. F.). **Evidence of hybridization between physiologic races of Ustilago hordei in passage through host.**—Abs. in *Phytopathology*, xxxiv, 11, p. 993, 1944.

Seed of Odessa (C.I. 934) barley, highly susceptible to races 3 and 6 of *Ustilago hordei*, was inoculated with a mixture of the two in equal proportions, and their relative contents in 25 of the resultant smutted heads determined by the artificial infection of differential hosts. Fifteen of the diseased heads contained only race 3, one only 6, seven a mechanical mixture of both, and two a different race, apparently arising through hybridization and capable of attacking varieties immune from 3 and 6. The 'synthetic' race is evidently not a new one, since the reactions induced by it on the differential barley varieties resemble those called forth by a spontaneously occurring race. Only a few of the further selections of the hybrid in subsequent generations lost the ability to infect varieties immune from races 3 and 6.

Peturson (B.). **Adult plant resistance of some Oat varieties to physiologic races of crown rust.**—*Canad. J. Res.*, Sect. C, xxii, 6, pp. 287–289, 1944.

It was observed during recent years that the new oat varieties Erban, Ajax,

and R. L. Nos. 1370 and 1510, although completely susceptible in the seedling stage to all the physiologic races of crown rust (*Puccinia coronata* var. *avenae*) [*R.A.M.*, xxiii, p. 330] that occur in Canada, possess in the adult stage a considerable degree of resistance to this rust under field conditions. The adult plant resistance of Erban was particularly marked in eastern Canada and less evident in the west; Ajax was generally more resistant than Erban in western and less resistant in eastern Canada. In inoculation experiments designed to determine the reactions of these oats to races 1, 2, 3, 4, 5, 6, and 38 of the rust, all the varieties tested were found to be susceptible to all the seven races in the seedling stage. In the adult stage, Erban was quite susceptible to races 1, 4, and 5 but resistant to 2, 3, 6, and 38; Ajax was susceptible to race 5, moderately resistant to races 2 and 3, and highly resistant to races 1, 4, 6, and 38; and R. L. Nos. 1370 and 1510 were highly resistant to all the seven races. Plants of the varieties that showed adult plant resistance were not uniformly resistant throughout, the upper leaves usually showing the least and the lower the most resistance. It is concluded from these results that some oats, of which Victoria, used in the present study as control, is a typical example, possess practically no adult plant resistance, others are resistant to some but not to all races, and still others are resistant to most.

Dillon Weston (W. A. R.). **Leaf spot of Oats.**—*J. Minist. Agric.*, li, 11, pp. 512–514, 1 fig., 1945.

This brief, popular note on oat leaf spot (*Helminthosporium avenae*), like the earlier papers in this series [*R.A.M.*, xxiv, p. 132], is illustrated by a chart depicting the life-cycle of the fungus.

Kingsolver (C. H.). **Pathogenicity on Avena and growth response of Pseudomonas coronafaciens (Elliott) Stapp.**—*Iowa St. Coll. J. Sci.*, xix. 1, pp. 29–31, 1944.

In a study conducted from 1940 to 1942, inclusive, *Pseudomonas coronafaciens* [see next abstract] was observed to attack species and varieties of *Avena* from the time the seed coat ruptured until the plant reached maturity. In some infected seeds the plume was completely destroyed and the radicle remained underdeveloped. Occasionally, the whole seed, except the lemma and palea, was so rotted that, on pressure, a yellowish-white viscous material was extruded. Plumule necrosis varied in severity. On the leaves the symptoms appeared as tiny, water-soaked spots 1 mm. or less in diameter, which became the centres of lesions showing yellow, halved areas, rapidly turning brown and becoming confluent or assuming a concentrically ringed appearance. Variety effect on symptoms was expressed as variation in colour, size, and number of lesions and definitions of concentrically ringed or confluent appearance. The lesions on the leaf sheaths were elongate, yellowed, confluent areas commonly without the concentrically ringed appearance. Lesions on culms and glumes were observed infrequently.

Many isolations were made from oat-leaf lesions of suspected bacterial origin. The lesions varied widely in size, shape, colour, and amount of halo, and differed in type with the host variety. Isolates from linear lesions with observable exudate were designated *P. striafaciens*; these did not differ in cultural reactions from *P. coronafaciens*. Isolations of *P. coronafaciens* var. *atropurpureum* from *Bromus inermis* were culturally similar to *P. coronafaciens*, except that they produced fluorescence in beef-peptone broth and showed a rather more rapid growth; they were pathogenic to oats. Cultural studies of 54 isolates of *P. coronafaciens* obtained from 1940 to 1942 showed that the organism present on oats in Iowa in these years essentially resembled the organism described by Elliott. Clearly defined cultural strains of *P. coronafaciens* could not be established.

Oat varieties experimentally infected by seed inoculation with *P. coronafaciens*, using a special technique, showed striking increases in pre-emergence mortality

and in disease severity on the surviving seedlings. Degree of varietal susceptibility changed with the test conditions. The behaviour most nearly resembling the field leaf reaction occurred at 70° F. At 50° separation of the disease injury into two categories was apparent, particularly in tests with hulled seed. The severity of the disease on the leaves agreed in general with field leaf reactions. Pre-emergent killing appeared to be relatively unrelated to severity of leaf symptoms. This seed infection method of inoculation appears to be of real value in estimating varietal response in oats to attack by *P. coronafaciens*.

The organism appears to be more prevalent and destructive on oats in Iowa than has so far been realized. Seedling injury and death may play a considerable part in the reduction of stands and the provision of inoculum for subsequent spread. The range of leaf symptoms studied permits the inclusion of halo blight of several types of leaf injury not before attributed to *P. coronafaciens*.

Field work showed that the oat varieties Boone, Marion, Hancock, Erban, Anthony, Mutica Ukraina, Gopher, and Landhafer, with selections from crosses between them, were in general susceptible to halo blight. Victoria × Richland selections were mostly intermediate, selections with Bond as a parent were mostly comparatively unaffected, and D-69 × Bond selections, as a group, were outstandingly resistant.

Gorlenko (M. V.) & Naydenko (A. I.). **Bacterial leaf spot of Oats caused in the USSR by Bacterium coronafaciens Ell.** —*C. R. Acad. Sci. U.R.S.S.*, N. S., xlii, 8, pp. 365–368, 1944.

A bacterial leaf spot of oats investigated during 1940 at the Voronezh Station for Plant Protection and during 1941 at the Laboratory for bacterial diseases at the Moscow Station, was identified as *Bacterium* [*Pseudomonas*] *coronafaciens* [*R.A.M.*, xxiii, p. 330 and preceding abstract]. The disease, which is stated to be widely distributed in the Soviet Union, occurring as far north as the Cola peninsula, becomes visible soon after the appearance of sprouts in the form of watery spots on young oat leaflets. These spots later dry up and turn reddish, the whole leaf blade ultimately dying away. On adult leaves the spots are large and diffuse, angular, brown-red with a lighter centre. They start at the edge but frequently cover the entire blade. The pathogenicity of the organism to oats was demonstrated by means of artificial infection of injured leaves; in three different field experiments in three localities in 1940 and 1941, 100 per cent. infection was obtained after an incubation period of two to three days. The bacterium failed to infect barley, wheat, or rye. Seed collected from badly infested plots was found to account for only 2 to 3 per cent. of diseased plants in the subsequent crop; percentages up to 34·8 occurred, on the other hand, in fields situated next or near to past season's infested plots. It is concluded from these facts that the main source of infection is last season's plant remains. The disease is further spread by rain and wind.

Pepper (B. B.) & Haenseler (C. M.). **Control of European Corn borer and ear smut on Sweet Corn with dusts and sprays.**—*Circ. N. J. agric. Exp. Sta.* 486, 14 pp., 1944.

After giving directions for the control of the European corn borer (*Pyrausta nubilalis*), the authors state that in New Jersey maize smut due to *Ustilago zeae* [*R.A.M.*, xxiii, p. 60] is the most destructive disease of this crop. On some early varieties it is frequently a major factor in determining profits and losses. In nearly every field a reduction of 5 per cent. in sweet corn crop due to smut is to be expected, and losses of 10 to 15 per cent. are very common. On some highly susceptible hybrids, 20 to 30 and occasionally over 60 per cent. of the ears are destroyed by the fungus.

Locally, when the corn is harvested for the green corn market, nearly all the smut

boils are left on the field to be disked or ploughed into the soil, in which the spores may remain dormant for a year or more, until maize is planted again. The spores may also be blown to other fields, with the result that the disease may occur in a field not planted to maize in recent years and remote from other maize fields. The disease may vary in intensity from year to year, sometimes causing little damage, sometimes much.

No satisfactory control methods are as yet available, but such practices as careful field sanitation, crop rotation, the use of resistant varieties, and a proper choice of maturity date have given partial control in some instances. The removal and destruction of all smut boils before they break and avoiding manures containing spores may prove helpful in small isolated fields and home gardens, but in commercial sweet corn areas such measures would probably have to be practised on a community basis to be of use. A four- to five-years' rotation helps, provided no contaminated manure is used and spores are not blown into the fields. No high quality, early, resistant varieties, suitable for New Jersey conditions, are available at present.

Early-planted sweet corn often shows heavier infection than later plantings, but this does not always hold. The weather in New Jersey is so variable that planting on any particular date does not offer much prospect of success. The growth rate and vigour of the plants, as affected by soil, climatic, and nutritional conditions, also affect the likelihood of infection, but well-nourished, rapidly growing plants are those most susceptible to attack.

Observations showed that the use of sprays and dusts against the European corn borer also reduced smut, marked reduction of infection occurring when dusts containing rotenone or nicotine as the active agent were used. Three formulae gave very good results: (*a*) finely ground derris or cube root (containing 5 per cent. rotenone) 20 lb., dusting sulphur 25 lb., wetting agent 2 oz., and talc or clay 55 lb.; (*b*) nicotine-bentonite concentrate (containing 14 per cent. nicotine) 28 lb., dusting sulphur 25 lb., walnut shell flour or talc 47 lb., and wetting agent 2 oz., and (*c*) finely ground derris or cube root (5 per cent. rotenone) 10 lb., nicotine-bentonite concentrate (14 per cent. nicotine) 14 lb., dusting sulphur 25 lb., wetting agent 2 oz., and talc or clay 51 lb. When rotenone and nicotine are used together, sulphur must be added. In formulae (*a*) and (*b*), however, the sulphur may be omitted, and an equal quantity of the inert carrier added, but smut control is better when the sulphur is used. Most of the smut control tests were conducted with the first formula.

As a rule, dusting was effected at intervals of five days, beginning about ten days before the first silks appeared, and ending five to seven days after silking started. Applications before the silks appeared were more effective in preventing ear infection than later ones. Power- and hand-dusters gave equally good results when the dust was directed downwards into the top whorl of the young plant, so that the dust settled on the tops of the leaves near the stalk and passed into the leaf sheaths of the older leaves.

In many tests over a period of four years, control never fell below 33 per cent., and most of the treated plots had only 20 to 50 per cent. as many infected ears as the controls. In a few instances, where the disease was not severe, the dusted plots showed no infection. As a rule, when untreated maize showed 30 to 50 per cent. infection, dusting gave 50 to 60 per cent. control, and when only 5 to 10 per cent. infection was present on untreated maize it gave 80 to 100 per cent. control.

Further work is being carried out to ascertain why rotenone and nicotine have proved so effective in smut control.

Leukel (R. W.), Martin (J. H.), & Lefebvre (C. L.). **Sorghum diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1959, 46 pp., 27 figs., 1 diag., 1944.

In this valuable compilation the authors summarize the latest available informa-

tion on sorghum diseases in the United States and give directions for their control by rational cultural methods and seed treatment with a standard fungicidal dust. Attention is drawn to the use of the crop as an adjunct in alcohol manufacture and the brewing industry.

Heyne (E. G.), Melchers (L. E.), & Lowe (A. E.). **Reaction of F_1 Sorghum plants to Milo disease in the field.** *J. Amer. Soc. Agron.*, xxxvi, 7, pp. 628–630, 2 figs., 1944.

Male-sterile Western Blackhull sorghum plants, resistant to milo disease [chiefly *Pythium arrhenomanes*: *R.A.M.*, xxiii, p. 101], were crossed with the susceptible Darso in 1941 and 1942, the F_1 progeny and parents being grown in the greenhouse each winter, and in 1943 in the field on infested soil at the Garden City Branch of the Kansas Agricultural Experiment Station [ibid., xvi, p. 807]. The hybrid reactions were found to vary according to the environment in which the plants are grown. Thus, under optimum conditions for infection in the greenhouse, the disease appeared early and eventually killed the F_1 plants, although they lived much longer than the susceptible parents. In the field, the development of infection is slower, and the symptoms generally less severe; they may, however, be readily observed on the roots and crown, which were not obviously affected in the resistant parents.

An apparent reversal of dominance, therefore, is merely a shift in expression of disease intensity due to environment. On the basis of these studies, the hybrid population may be divided into three classes: susceptible, intermediate, and resistant.

Motz (F. A.). **The fruit industry of Argentina.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 1. 102 pp., 39 figs., 1 map, 1942. [Photo-lithographed. Received January, 1945.]

This report contains much valuable information on various aspects of the production and marketing of deciduous and citrus fruits in Argentina, including the measures in operation for pest and disease control [cf. below, p. 152]. The most serious problem confronting citrus-growers in Corrientes and Misiones is the 'poor rootlet' disease associated with incompatibility between the sweet orange scions and the sour orange stocks [cf. *R.A.M.*, xxiii, p. 484]. This combination is believed by local plant pathologists to encourage a deep-rooting system, the root hairs developing in the subsoil and coming into contact with an excess of toxic salts and moisture, which result in their decomposition. A similar trouble began in 1938–9 to affect grapefruit on rough lemon stocks. In the Pindapoy district, 11,000 grapefruit and 35,000 orange trees were estimated to have succumbed to the disease.

Spraying against the other economically important citrus diseases, gummosis [*Phytophthora parasitica* and *P. citrophthora*] and scab [*Elsinoe australis*], is not effectively carried out, some growers making one or two applications and others none.

Childs (J. F. L.) & Siegler (E. A.). **Experimental control of Orange decays with thiourea.**—*Phytopathology*, xxxiv, 11, pp. 983–985, 1944.

In tests *in vitro* with thiourea [*R.A.M.*, xviii, p. 136] dissolved in maize meal agar, the growth of *Diplodia natalensis* was inhibited between 0·1 and 0·2 per cent. and that of *Phomopsis* [*Diaporthe*] *citri* and *Penicillium digitatum* between 0·01 and 0·02 per cent. Concentrations of thiourea ranging from 10 to 0·1 per cent. were tested in several experiments on oranges. Approximately 50 per cent. control was obtained with 1 per cent. concentration and over 90 per cent. at 4 per cent. A 2 per cent. concentration was only slightly less effective and a 10 per cent. concentration not significantly more effective than a 4 per cent. concentration.

Trials were also carried out to determine the effect of washing or brushing the fruit after dipping on the fungicidal action of thiourea. Fruits dipped in a 5 per cent. solution, on which the chemical was allowed to dry before washing, remained sound; in those washed while still wet the incidence of decay amounted to 19 per cent. as against 44·6 in the controls. In treated fruits dried while still wet by means of revolving brushes there was 10 per cent. rot compared with 43·3 per cent. in the untreated. In one test on 80 dipped fruits, complete control was secured by air-drying after brushing.

In two experiments with Valencia oranges exposed for 40 and 42 hours to ethylene gas vapours and coated in a proprietary wax emulsion to prevent wilting, there was 2·4, 1·2, and 34·5 per cent. decay after 18 days' storage in the lots treated with (*a*) 5 per cent. thiourea alone, (*b*) the same emulsion, and (*c*) controls, respectively.

Ling (L.) & Yang (Juhwa Y.). **Studies on the biology and pathogenicity of Colletotrichum indicum.**—*Ann. Bot., Lond.*, N. S., viii, 29, pp. 91–104. 2 figs., 4 graphs, 1944.

Cotton cotyledons and bolls showing symptoms resembling those of anthracnose (*Glomerella gossypii*) at Chengtu, Szechwan Province, western China, in 1938 yielded a fungus which was identified, on the basis of its morphological and physiological characters on the host and in potato dextrose agar cultures, as *Colletotrichum indicum* [*R.A.M.*, xiii, p. 508]. In nature the acervuli measure 27 to 124μ in diameter, and the falcate conidia with obtuse ends, 16·5 to 27·5 by 3 to 5μ. The dark brown, uni- to tri-septate setae, ranging from 40 to 216 by 3 to 7·7μ, are produced at an early stage of growth on the stroma, mostly intermingled with the hyaline, cylindrical, simple conidiophores, 5·5 to 15·1 by 1·9 to 4·1μ. The dimensions of the same organs in pure culture are as follows: acervuli 36 to 184μ, conidia 19·3 to 33 by 2·8 to 4·4μ, setae 69 to 399 by 3·3 to 9·1μ, and conidiophores 8·3 to 34·4 by 1·9 to 3·3μ.

The optimum temperature for the germination of the conidia was about 32° C. and for the growth of the fungus on the agar medium 28°. Conidial germination and mycelial development were most profuse at P_H 5·4 and 5·4 to 7·6, respectively. The conidia proved very susceptible to desiccation, which they withstood for less than 24 hours.

Inoculation experiments were successful both on Chinese varieties of *Gossypium arboreum* and on *G. hirsutum* (Delfos 531 and Trice) of American origin. Seed immersion in conidial suspensions of *C. indicum* resulted in a high percentage of diseased seedlings, while spraying the young plants with the same material induced dark green, later greyish-brown lesions on the cotyledons, stems, leaves, and detached bolls. In 1938, inoculated seed in sterilized soil produced 100 per cent. diseased plants of *G. arboreum* and 67·3 per cent. Trice, the corresponding figures for 1941 being 84·4 and 61·4 (for Delfos 531), respectively. When germination trays were used in 1941, 46·6 per cent. of the plants from inoculated local seed became infected and 41 per cent. were killed, the corresponding figures for Delfos 531 being 39·5 and 29 per cent., respectively. All the controls in both series of tests remained healthy. Chilli (*Capsicum annuum* var. *grossum*), tomato, and egg-plant fruits, and soy-bean and cowpea pods were also inoculated with positive results, but the seedlings were not attacked.

Overwintering takes place chiefly within the diseased seeds, and possibly in the infected host refuse left in the field. Fairly high temperatures combined with very humid conditions promote the development of *C. indicum*, the latter factor being of great importance in Szechwan. Not only do rainy or cloudy periods assist the germination and dissemination of the conidia, but they prevent the desiccation of the mucilaginous matrix, thereby affording increased chances for the survival of the infective material.

Vannah (H. P.), Ray (C.), & Wolf (F. A.). **Sclerotial disease of Flax caused primarily by Sclerotinia sclerotiorum (Lib.) Massee.**—*J. Elisha Mitchell sci. Soc.*, lx, 2, pp. 99–108, 5 pl., 1944.

In the summer of 1943, flax growing near Haltville, California, was found to have lodged and to show stem-break; *Sclerotinia sclerotiorum*, not previously recorded on this host in the United States, was abundantly present inside the stems in its mycelial and sclerotial states. The most conspicuous symptom in the field was the occurrence of patches of lodged and broken plants. The affected stems when bent either became completely severed or only the axial elements broke, the top portion remaining attached to the plant by strands of fibre and dangling. The broken-off parts made up two-thirds or more of the stem length. The affected stems were usually paler than healthy ones. Of even better diagnostic value was the presence of one per cm. of stem length of hard, black, cylindrical sclerotia within the pith cavity. The stature of the diseased plants was smaller than that of normal ones, the root systems were impaired by the death and decay of the smaller roots, and the yield of seed was reduced. The seed from affected plants was sometimes less plump than that from normal ones.

When healthy flax seeds were planted in pots of artificially infected soil, the seedlings succumbed to infection, and the fungus was recovered in pure culture. In similar tests, *Polyspora lini* and *Sphaerella linorum* were less destructive. Sclerotia from potato dextrose agar cultures of *Sclerotinia sclerotiorum* were placed in moist sand at 70° F. and produced apothecia in about six weeks.

By inducing changes in flax tissues, the disease affects both the yield and the quality of the fibre. In one test in which a 92 gm. sample of straw from an infected crop was decorticated according to the method used in preparing flax for the manufacture of cigarette paper, 31 gm. of tow were extracted, containing 39·44 per cent. of pure fibre which was short and weak. Assuming that half the sample consisted of diseased straw, the yield of chemically treated fibre was 12·63 per cent. as against 15·3 per cent. for a similar sample of normal straw. The per cent. fibre of a completely diseased sample was 9·96. The efficiency of recovery of fibre in mechanically decorticating the straw, probably half of which was infected, was 60·5 per cent. whereas that from normal straw invariably approximates to 85 per cent.

McClellan (W. D.) & Stuart (N. W.). **The use of fungicides and growth substances in the control of scale rot of lilies.**—*Phytopathology*, xxxiv, 11, pp. 966–974, 3 figs., 1944.

The bulb scales of two *Lilium longiflorum* clones and *L. testaceum*, which are known to be very susceptible to the rot caused by *Fusarium oxysporum* f. *lilii* Imle (*Amer. Lily Yearb., 1942*, pp. 30–41, 1942) [cf. *R.A.M.*, xxii, p. 434], and those of a mixture of more resistant Easter lily clones were treated with some or all of the fungicides ceresan, arasan, fermate, zincate (zinc dimethyldithiocarbamate, R. T. Vanderbilt Co.), spergon, and formaldehyde and planted for four to six weeks on a greenhouse bench under moist sphagnum. Coatings of arasan and spergon (2 oz. per 60 and 100 lb. scales, respectively), conferred very satisfactory protection, the former being preferable for the very susceptible varieties. Ceresan (1 lb. in 40 gals. water, two minutes' immersion) also proved to be an effective fungicide, but inhibited bulblet production unless arasan was applied after the ceresan. Fermate and zincate did not give adequate control of the pathogen, and formaldehyde damaged the scales.

Combinations of arasan and spergon with the growth substances, indolebutyric acid and naphthaleneacetic acid, at the rate of one part of the growth substances to 500 of the fungicidal carrier, resulted in heavier rooting and more bulblets than did either alone, arasan being superior to spergon and naphthaleneacetic to indolebutyric acid.

Jenkins (Anna E.). **Oedema of cultivated Violet identified as scab.**—Abs. in *Phytopathology*, xxxiv, 11, p. 992, 1944.

From her recent examination of a specimen of the so-called 'oedema' of sweet violets collected by B. T. Galloway at Garrett Park, Maryland, the author is convinced that the disease described under this name in 'Commercial Violet Culture' (1889) is identical with scab (*Sphaceloma violae*) [*R.A.M.*, xxiv, p. 60]. The leaf and petiole symptoms of the two conditions correspond, and scrapings from the 'oedema' lesions yielded hyphae and conidia agreeing with those of *S. violae*. At the time when 'oedema' was causing trouble in Maryland, the same disease was rife in the Hudson, according to information supplied to the writer by a retired grower from that region, who, like Galloway, specified poor aeration, excessive moisture, and cold as predisposing factors. As shown by previous reports, scab has been more or less prevalent on native wild violets in the District of Columbia, and in 1935 it was observed in profusion on a wild form growing luxuriantly in a glade in Rock Creek Park, Maryland, i.e., in the same stream valleys as at Garrett Park. Galloway's description and specimen may now be accepted as the first record of *S. violae*.

Jones (L. K.). **Streak and mosaic of Cineraria.**—*Phytopathology*, xxxiv, 11, pp. 941–953, 4 figs., 1944.

Greenhouse cinerarias (*Senecio cruenta*) in the State of Washington suffer from two virus diseases, streak and mosaic [*R.A.M.*, xxii, p. 240], of which the former is particularly destructive, causing leaf and stem necrosis and wilting of the plants towards flowering time, with a resultant loss of 20 to 50 per cent. Mosaic causes a mottling, puckering, and malformation of the leaves and dwarfing of the plants. Though widely distributed, it is not very prevalent, affecting only 2 per cent. of the plants, for instance, in one of the houses visited in 1938, and except in severe cases does not materially lower the sale of the plants. The streak virus is transmissible through the seed, by mechanical contact between diseased and healthy tissues, and by *Thrips tabaci*, but is rapidly inactivated in extracted plant juice. It was transmitted to tomato and peas, the symptoms on which, together with other characters of the virus, point to its being a strain of the tomato spotted wilt virus. The mosaic virus is also transmissible through the seed, by mechanical inoculation methods, and by *Aphis marutae*, but, unlike streak, it failed to infect any of the other plants tested and is therefore presumably specific to its own host. Its thermal death point lies near 70° C. and it persists in extracted plant juice for a fortnight.

Control measures should include the selection of healthy plants for seed production, the extermination of the insect vectors, weed destruction, and care to avoid the handling of infected plants before attending to sound ones.

Dimock (A. W.). **Hot-water treatment for control of Phytophthora root rot of Calla.**—*Phytopathology*, xxxiv, 11, pp. 979–980, 1 fig., 1944.

The successful use of hot water against *Pythium* root rot of *Aloe variegata* [*R.A.M.*, xxiii, p. 21] suggested the application of a similar treatment to Calla lily (*Zantedeschia* sp.) rhizomes infected by *Phytophthora richardiae* [ibid., xii, p. 26], and 15 of these were accordingly soaked for one hour in water heated to 50° C. on 8th November, 1943, two days before planting in sterilized soil. On 17th March, 1944, the foliage and roots of all the treated plants were perfectly sound, whereas those of the 15 controls were completely decayed. These results indicated that hot water may serve as an effective substitute for chemical disinfectants against *P. richardiae*, a further advantage of the former consisting in the absence of any deleterious influence on sprouting or flowering.

Menzies (J. D.). **Transmission studies with Alfalfa witches'-broom.**—Abs. in *Phytopathology*, xxxiv, 10, p. 936, 1944.

The symptoms of witches' broom of lucerne appear in the stock two months after shoot-grafting and in five to six months where root-grafting is practised [*R.A.M.*, xxii, p. 240]. The disease was transmitted by the former method to *Medicago lupulina* and *M. hispida*. The leaf-hopper *Platymoideus acutus*, which is widespread throughout the United States and Canada, was experimentally shown to be capable of conveying the virus from infected to healthy plants.

Ark (P. A.). **Bacterial blight of Purple Vetch caused by Phytomonas pisi.**—Abs. in *Phytopathology*, xxxiv, 10, p. 933, 1944.

Purple vetch (*Vicia atropurpurea*) and Canadian field peas in a field covering several acres in Sonoma County, California, were severely attacked by *Phytomonas* [*Pseudomonas*] *pisi*. On the former, infection frequently originated at the middle of the stem and spread rapidly downwards, killing the plants. Occasionally, however, only the tips were blighted, the progress of the disease probably being arrested by a rise in temperature. Isolates from both hosts infected peas, and greenhouse cross-inoculation experiments gave positive results.

Fischer (G. W.). **The blind-seed disease of Ryegrass (Lolium spp.) in Oregon.**—Abs. in *Phytopathology*, xxxiv, 10, pp. 934–935, 1944.

Perennial rye grass (*Lolium perenne*) seed germinated very poorly in sections of the Willamette Valley, Oregon, in 1942 and 1943 owing to infection by *Phialea temulenta* [*R.A.M.*, xxiii, p. 230], the apothecia of which were found in profusion both on the species in question and *L. temulentum*, while a few were also harboured by old seeds of *Hordeum gussoeanum*. The conidial state of the pathogen was detected on *Agrostis exarata* var. *monolepis*, *Aira caryophyllea*, *Alopecurus geniculatus*, *Bromus racemosus*, *Cynosurus echinatus*, *Deschampsia caespitosa*, *Danthonia californica*, *Festuca elatior*, *F. myuros*, *Glycena borealis*, *H. gussoeanum*, *Holcus lanatus*, and *Phleum pratense*.

A modification of the New Zealand method for the qualitative and quantitative estimation of blind seed in currant crops of *L. perenne* and in seed samples is now being tested. Random head samples are chopped and soaked for a short time in water, which is then strained through a cheesecloth and centrifuged. The residue is then examined microscopically for the conidia of *Phialea temulenta*, the incidence of which expresses the severity of blind seed in a given field. No apothecia were found where low-germination (53 per cent.) seed was planted in the spring, whereas autumn-sown seed of the same lot yielded an average of 6·8 of the fruit bodies per sq. ft. in the following spring.

McKinney (H. H.). **Studies on the virus of Brome-grass mosaic.**—Abs. in *Phytopathology*, xxxiv, 11, p. 993, 1944.

The end point of brome grass mosaic virus [*R.A.M.*, xxi, p. 371] activity in extracts from the host is ten minutes at 78·5° C., near 10^{-5} when diluted with water, and in dry leaf tissue at laboratory temperatures beyond 306 days. Grass hosts include wheat, rye, barley, oats, sorghum, Johnson grass [*Sorghum halepense*], Sudan grass, teosinte [*Euchlaena mexicana*], maize, and other annual and perennial species in nine tribes. Inoculation experiments were performed with the aid of carborundum. In maize seedlings at the two- to three-leaf stage, at high growing temperatures, the first reactions develop 36 to 40 hours after inoculation, the reactions comprising chlorosis, necrosis, and the death of the host. In other grasses the responses to infection range from carriers showing no perceptible symptoms to mild or severe chlorotic mottling or streaking. Natural resistance in the host increases rapidly with advancing age. In Scotia bean the first infected leaves bear small,

local, necrotic lesions, while Early White Spine cucumber cotyledons and Samsun tobacco leaves develop a faint, chlorotic spotting; a local increase of virus occurs in each host.

Motz (F. A.). **The fruit industry of Chile.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 3, 46 pp., 9 figs., 1 map, 1942. [Photo-lithographed. Received January, 1945.]

This useful digest of the available information concerning the Chilean fruit industry contains a section on pest and disease control, from which it appears that climatic conditions are not, on the whole, particularly conducive to parasitic development. Most growers are equipped with spraying outfits, and in general, the results of plant-protective treatments are satisfactory, but powdery mildew has assumed a rather serious form on stone fruits which requires a more extensive programme than the one dormant application commonly given. Apple and pear scab [*Venturia inequalis* and *V. pirina*] may also give trouble in the southern part of the Central Valley, and here again more attention to the spraying schedule is indicated, only half the recommended number of six to nine treatments being actually applied.

Motz (F. A.) & Mallory (L. D.). **The fruit industry of Mexico.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 9, 184 pp., 120 figs., 1 graph, 9 maps, 1944. [Photo-lithographed.]

Included in this valuable, fully tabulated survey of various facets of the Mexican fruit industry is an interesting account of the banana 'Sigatoka' disease [*Mycosphaerella musicola*: *R.A.M.*, xviii, p. 192]. This is stated to have been the decisive factor in the collapse of banana production, coinciding as it did with two other contributory causes, namely, the Government expropriation of land and agrarian troubles. The disease was first observed in Mexico in 1937. Production for the country fell from 525,000 metric tons in 1937 to 240,000 in 1941, when exports from Tabasco (the first State to be affected) ceased entirely. Chiapas was the first State to inaugurate in 1941 a successful spraying campaign, subsidized by the semi-governmental Banco de Comercio Exterior, and by the end of 1942 the position had undergone a considerable improvement, reflected in the expansion of foreign and domestic markets. At this time 100 carloads were leaving the State weekly compared with 30 at the beginning of the same year, but even so, the 26 exporters constitute only a small percentage of all persons engaged in the banana industry. The life-cycle of the pathogen necessitates the application of Bordeaux mixture at three-weekly intervals during the rainy season, and the Bank's instructions prescribe 14 annual treatments, the number actually given, however, averaging nearer 11. Two sizes of spraying machines are available with tank capacities of 300 and 150 gals. and potential top pressures of 600 and 400 lb., respectively, the average used approximating to 300. In January, 1943, some 460,000 mats, covering 1,340 ha., were being sprayed regularly at an average dosage of 5 l. per mat per treatment, and the Bank was contemplating the provision of additional equipment and chemicals for the protection of 300,000 more mats. In 1942 a total of 462 metric tons copper sulphate was imported into Chiapas for this purpose, nearly all from the United States.

Foot rot [*Phytophthora parasitica* and *P. citrophthora*], scaly bark [psorosis], anthracnose, and melanose [*Diaporthe citri*] are the principal citrus diseases. In general, they are not sufficiently virulent to threaten the loss of groves or markets, and therefore the majority of growers have taken no active steps to organize effective control.

Experiments are reported to be in progress on the development of a pineapple variety resistant to *Thielaviopsis* [*Ceratostomella*] *paradoxa*.

Quinces are grown on a fairly large scale in the State of Coahuila, where fireblight

[*Erwinia amylovora*] appeared 10 or 12 years ago, and some severe cases of crown gall [*Bacterium tumefaciens*] have been observed. Fireblight, though of slight importance on the quince, is destructive to pears, the cultivation of which, in fact, is rapidly declining from this cause. The supply of fresh deciduous fruits on Mexican markets being far short of the demand, appearance and grade defects are not determining factors in their saleability. Moreover, the cost of imported fruit is prohibitive, and domestic products are therefore widely distributed at an attractive price. There are no recommended spray schedules for the country.

Montgomery (H. B. S.) & Wormald (H.). **Silver leaf and papery bark in Apple trees.**—*Rep. E. Malling Res. Sta., 1943*, pp. 51–52, 1944.

To ascertain whether papery bark of top-grafted apple trees was entirely due to cutting-back, or whether it was associated with silver leaf (*Stereum purpureum*) [*R.A.M.*, xxiii, p. 27], an experiment was carried out in which nine five-year-old Newton Wonder apple-trees were cut back to different levels, three having the whole head removed, three having all the branches cut back to about 6 in. of the crotch, and three having only one branch so cut. Two trees in each set were inoculated on the cut ends on 18th May, 1943, and the remaining tree used as a control.

The control trees all produced healthy shoots, but the tree with the entire head removed and that with all the branches cut back showed (in winter) papery bark for 2½ in. and 2 in., respectively, while that with only one branch cut back presented no papery bark. The inoculated trees all developed infection, severity depending on the extent of the cutting-back. Trees with the heads completely removed and those with all the branches cut back all showed, in summer, pronounced silver leaf and some papery bark just below the cuts; in winter, papery bark was present along the entire stem, and there were many fructifications of *S. purpureum* from the crotch to ground-level. In the two inoculated trees with only one branch cut back, there was no papery bark in summer and only a trace of silver leaf on one; in winter they showed papery bark for 2 in. below the cut surface.

It is concluded that severe cutting-back was an important predisposing factor in causing papery bark, and that while the condition was produced to a very slight extent in the absence of *S. purpureum* it was much more conspicuous and extensive where hard cutting-back was combined with infection through the cut surface. These results confirm the view that the risk of loss from grafting as a result of papery bark and silver leaf in apple-trees can be reduced by frame-working instead of top-grafting when converting one variety of apple tree to another.

Crane (M. B.). **Origin of viruses.** -*Nature, Lond.*, clv, 3926, pp. 115-116, 1945.

Two abnormalities have recently been noted in the Lord Lambourne apple variety when grafted on to certain others: lack of rigidity in the branches and growth, and reduction in fruit size to about one-quarter of the normal. The behaviour of these abnormalities suggests that they are of a virus nature and have arisen directly by grafting [cf. *R.A.M.*, xxiv, p. 48].

Keyworth (W. G.). **Verticillium wilt of Plum.** - *Rep. E. Malling Res. Sta., 1943*, pp. 52–54, 2 figs., 1944.

From a wilted six-year-old Victoria plum tree growing on a fruit and hop farm in Kent the author isolated *Verticillium albo-atrum* [cf. *R.A.M.*, vii, p. 179]. The fungus appeared to be morphologically identical with isolates obtained from hops on the same farm affected with *Verticillium* wilt. Infection had apparently originated from wilted hop bines placed round the base of the tree eleven months before.

Bottomley (A[veril] M.). **Peach and Apricot freckle.**—*Emg S. Afr.*, xix, 225, pp. 762–763, 1 fig., 1944.

Peach and apricot freckle (*Cladosporium carpophilum*) [*R.A.M.*, xxiii, pp. 251,

475] occurs throughout the Union of South Africa, where it is most severe in the summer-rainfall areas. It attacks late varieties of peach and apricot mostly, but occasionally affects nectarines and plums. The fruit, leaves, and young twigs may all become infected, but the disease is conspicuous only on the fruits, which may be so disfigured as to be unmarketable and useless.

The most effective control consists in spraying three to four weeks after petal-fall, three weeks later, one month after the first treatment, and then at monthly intervals until maturity with wettable sulphur (5 to 6 lb per 100 gals. water), dry-mix lime-sulphur (20 lb. sulphur, 10 lb. hydrated lime plus 1¼ lb. dry calcium caseinate mixed to a paste and added to 100 gals. water), or any copper- or sulphur-containing proprietary mixture. If lime-sulphur is used, it should be diluted to 1 in 200.

Taylor (C. F.). **Peach branch cankers in Virginia and West Virginia.**—*Plant Dis. Reptr*, xxviii, 22, pp. 718–719, 1944. [Mimeographed.]

Rough cankers of peach branches, mostly initiated at a crotch, and characterized by prominent annular rings of callus are attributed to arsenical injury following the application of arsenical sprays without zinc sulphate, or the inefficient use of this substance as a means of rendering the arsenic safe. *Coniothyrium fuckelii* was predominantly associated with this canker.

Roberts (Catherine) & Barrett (J. T.). **Intercellular mycelium of Taphrina deformans in Peach fruit.**—*Phytopathology*, xxxiv, 11, pp. 977–979. 1 fig., 1944.

Peach fruits from Davis, California, submitted to the writers for investigation by Dr. E. E. Wilson in 1942, bore discoloured, slightly raised lesions resembling those illustrated by R. E. Smith (*Ext. Circ. Calif. agric. Exp. Sta.* 120, 1941) and contained a small amount of subepidermal mycelium of *Taphrina deformans* essentially similar to that harboured by infected leaves. In a personal communication, Dr. Wilson reported the detection of asci and ascospores on the surfaces of some of the fruits in question, similar observations on peaches having previously been made by Clinton (*Rep. Conn. agric. Exp. Sta., 1914*, Part 1, pp. 1–42, 1914), G. and M. Arnaud in France [*R.A.M.*, xi, p. 526], and G. H. Cunningham on nectarine in New Zealand [ibid., ii, p. 373]. Herbarium specimens, mostly bearing raised lesions, from unknown localities in California, also yielded a profusion of intercellular, septate mycelium, sometimes at a depth of 2½ mm. below the epidermis, besides subcuticular mycelium and ascogenous cells. Trichomes were scarce or absent on the surfaces of the elevated areas. On the other hand, the histological examination of fruits showing the warty protuberances figured by Rose *et al.* [ibid., xvi, p. 474], on which trichomes were plentiful, disclosed no trace of the fungus, and it is considered doubtful whether this symptom is indeed diagnostic of the presence of *T. deformans*. In this connexion attention is drawn to the similarity between the warts supposedly characteristic of leaf curl and the excrescences described by Blodgett as the distinctive feature of peach wart [ibid., xxii, p. 213].

Cochran (L. C.). **The 'complex concept' of the Peach mosaic and certain other stone fruit viruses.**—Abs. in *Phytopathology*, xxxiv, 10, p. 934, 1944.

The results of several years' study indicate that the intensity and type of symptoms induced by the peach mosaic virus from different sources on the Hale variety vary appreciably. Hitherto, viruses from different sources were arbitrarily divided, according to their effects on the host, into severe, medium, and mild categories and were designated as strains. However, the available information now indicates the existence of innumerable subdivisions which, given enough sources, overlap to form a symptom gradient in which no recognizable strains can be segregated. Thus, when the peach mosaic virus from various sources is inoculated into

apricot and certain other stone fruits, a severe to symptomless gradient develops which may or may not agree with the virulence of expression in peach. Similar gradients have also been observed in the cases of peach ring spot [*R.A.M.*, xxi, p. 85], asteroid spot [ibid., xix, p. 417], and some of the cherry viruses. In conformity with a suggestion by C. W. Bennett, it is proposed to reserve the term 'strain' for variants sufficiently well defined to be recovered from nature and identified, while viruses from individual sources causing a wide variety of symptom manifestations should be designated with appropriate descriptive epithets, as 'forms' or 'isolates', and collectively referred to as 'complexes'.

Cochran (L. C.) & Rue (J. L.). **Some host-tissue relationships of the Peach mosaic virus.**—Abs. in *Phytopathology*, xxxiv, 10, p. 934, 1944.

Evidence that the peach mosaic virus invades all living parts of the tree except the seeds was secured by inoculation experiments, in which infected leaf, fruit, bark, and wood tissues were inserted beneath the cortex in T cuts. Transmission was effected with green, hard-ripe, and firm-juicy-ripe fruit tissue, but not with soft-ripe or dried, or with fragments of integuments or embryo. Peaches further contracted infection when grafted in a similar manner with fruit tissue from diseased plums, apricots, and almonds, and wood shields cut from apricot and peach twigs stripped of their cambium. Peach trees inoculated at the close of the dormant period and when the leaves measured 1 in. developed mosaic symptoms in 14 and 50 days, respectively, while in those with fully expanded initial leaves infection usually became established only in shoots on a level with and below the site of insertion, and inoculations performed after June did not induce disease manifestations until the resumption of growth in the following year.

Grubb (N. H.). **The comparative susceptibility of high- and low-worked Cherry trees in the nursery to bacterial canker.**—*Rep. E. Malling Res. Sta., 1943*, pp. 43–44, 1944.

Low-worked trees of Bigarreau Napoleon cherry in the nursery were significantly more injured by bacterial canker [*Pseudomonas mors-prunorum*: *R.A.M.*, xxiii, p. 31] when three years old from the bud than high-worked trees one year old from grafting. At two years old from grafting there was significantly less injury to the high-worked trees where the stocks were the vegetatively propagated F12/1 selection than where they were stocks raised from seed from any one of four sources.

Moore (M. H.). **Cherry scab (Fusicladium cerasi (Rabenh.) Sacc.) in Kent in 1943.**—*Rep. E. Malling Res. Sta., 1943*, pp. 54–56, 1 fig., 1944.

On 21st July, 1943, Morello cherries at East Malling showed the presence of circular, olive-green spots measuring up to 2 mm. in diameter, scattered over the surface of the fruits. From these the conidia of *Fusicladium* [*Venturia*] *cerasi*, not hitherto recorded from the Station, were readily liberated in water, the mean size (100 spores) being 17·5 by 5μ, 54 per cent. 17 to 18μ long, 69 per cent. 5μ broad, range 9 to 22 by 4 to 6μ; twelve spores uniseptate, the remainder non-septate. Most were narrowly ellipsoid, rounded at the distal end, and slightly wedge-shaped at the other. Some tended to be slipper-shaped. No trace of the fungus was found on the bud scales and young shoots, and even on the young leaves infection was extremely difficult to find.

The disease was also present on a few fruits of the sweet variety Small Black Mazzard and the Duke variety Belle de Chatenay (nomenclature uncertain). Of the other acid varieties, Carnation, Coe's Late Carnation, and Kentish Red yielded many scabbed fruits. Apparently nearly all the sweet cherries escaped infection, possibly because they ripened earlier than the acid ones, which themselves appear

to have been unaffected at a slightly earlier stage. Infection was much heavier in the wetter than in the drier and windier end of the plot.

The fungus has been previously reported on cherry only four times in England in 25 years.

Zeller (S. M.), Milbrath (J. A.), & Cordy (C. B.). **Albino Cherry, a virus disease in southern Oregon.** Abs. in *Phytopathology*, xxxiv, 10, p. 937, 1944.

Albino cherry, apparently a form of buckskin [*R.A.M.*, xxi, p. 83], first detected at Ashland in 1937, has now spread as far as Gold Hill, Oregon. Bing or Napoleon trees usually die three or four years after the initial symptoms appear, while Lambert, Black Republican, and Montmorency react more slowly, the effects occurring irrespective of the type of root used (Mazzard or Mahaleb). The disease is more severe in irrigated orchards than under dry-land culture. Die-back is a common symptom of infected branches, the leaves on which turn a uniform olive-brown to golden-greenish, with upward-rolling margins; just before abscission they assume a chlorotic to orange tinge, with a pinkish shading, especially in a pinnate pattern along the midrib and lateral veins at the base. Small, green, rosetted leaves are produced from terminal buds on the spurs during late summer. The fruits remain small and green, later turning white even in dark red varieties. Inoculation experiments do not form a satisfactory basis for the study of the symptoms of albino, since the trees die within a year of the operation.

Demaree (J. B.) & Jeffers (W. F.). **Phytophthora fragariae Hickman and methods of testing Strawberry plants for resistance.**—Abs. in *Phytopathology*, xxxiv, 11, p. 991, 1944.

A new technique has been evolved for testing the resistance of strawberries to red stele (*Phytophthora fragariae*) [*R.A.M.*, xxii, pp. 363, 441, 488], consisting in the multiplication of the fungus on Lima bean agar in Petri dishes and the immersion in water of small pieces of the culture, which produce zoospores for inoculum. Suspensions of this material are added at the rate of 5 c.c. per pot to the soil in 2-in. pots in a cool greenhouse, in which the plants are kept pending the development of symptoms. Susceptible individuals contract the disease in two to three weeks; the remainder are reinoculated and, if still resistant, planted in naturally infested soil for fruiting tests.

Rogers (W. S.) & Buttfield (Joan M.). **The production of healthy Strawberry runners (methods recommended for special stock nurseries).**—*Rep. E. Malling Res. Sta., 1943*, pp. 87–94, 4 figs., 1944.

In this paper the authors give a detailed account of the method recommended for the production of healthy strawberry runners, with special reference to the avoidance of virus diseases. The methods in question have been developed at East Malling and have been used for raising runners in the Ministry of Agriculture's Nuclear Stocks Scheme, which is being developed into a Special Stock Certification Scheme. The main points of the system are (1) treating runner-raising as a specialized business, entirely apart from fruit production, (2) establishing runner nurseries well away from existing strawberry areas, and (3) raising runners in these nurseries by an 'isolated block' system.

As regards disease control, to ensure that the bed starts free from infestation by *Capitophorus fragariae* all runners should be dipped before planting in a nicotine solution. Towards the end of May or early in June the bed should be dusted with flowers of sulphur as a precaution against mildew [*Sphaerotheca humuli*], the application being repeated, if necessary, in August. The virus diseases which are important at present are severe crinkle [*R.A.M.*, xxii, p. 32] and yellow edge [ibid., xxii, p. 240]. Crinkle symptoms usually reach their greatest intensity in June,

when the first roguing should be carried out, a second inspection being undertaken in September. Any yellow-edge plant seen at the first inspection should be removed, but the best time for roguing yellow-edge plants is from the middle of September to the middle of October. Under normal conditions, the percentage of plants removed, including those showing lack of vigour due to any other cause, has usually been under 1 per cent. With tolerant varieties, any plant showing reduced vigour, flattening, or visible symptoms of virus disease should be removed.

[This paper is reprinted in *Fruitgrower*, xcviii, 2542, pp. 156, 160; 2544, pp. 200, 206; 2546, pp. 238, 243, 1 fig., 1 diag., 1944.]

HARRIS (R. V.). **Norfolk Giant—a reliable Raspberry for the present day.**—*Rep. E. Malling Res. Sta., 1943*, pp. 108–110, 1 fig., 1944.

After pointing out that the Ministry of Agriculture is now prepared to undertake the inspection of stocks of Norfolk Giant raspberries 'in respect of purity and freedom from disease', the author expresses the opinion that this will introduce a completely new era in raspberry cultivation in Britain. Norfolk Giant possesses the valuable and distinctive feature of being highly expressive of both mosaic and leaf curl, although it has a marked natural resistance to mosaic. In spite of this, a small but growing proportion of mosaic-infected stocks is present in most plantations, which is appreciably higher where this variety has been raised alongside highly infected varieties such as Red Cross or Lloyd George [see above, p. 137]. This increase in mosaic disease must be promptly checked if the variety is to be preserved. This can easily be done, and all growers with young, healthy plantations of Norfolk Giant are urged to enter them for certification by the Ministry.

WORMALD (H.). **Nut drop—a disease of cultivated Hazel Nuts.**—*Rep. E. Malling Res. Sta., 1943*, pp. 56–58, 2 figs., 1944.

This is a reprint of a paper already noticed from another source [*R.A.M.*, xxiii, p. 136].

MCWHORTER (F. P.) & MILLER (P. W.). **The application of vapour heat as a practical means of disinfecting seeds.**—Abs. in *Phytopathology*, xxxiv, 10, pp. 935–936, 1944.

Moist heat supplied by a vapour-heat machine was shown by the results of several hundred tests to compare favourably in many respects with hot water for seed treatment, among its advantages being the following: (1) critical temperature control is unnecessary to ensure disinfection and prevent seed injury; (2) the treatment is readily applicable to tons of seed simultaneously; (3) the same machine removes the slight excess moisture without re-handling the seeds; and (4) vapour heat can be applied to seeds on moving belts suitable for large-scale commercial operations. Seed of peas, beet, cabbage, and various grasses can withstand temperatures of 140° to 150° F. for 90 to 40 minutes, respectively, without significant reduction or delay in germination. Species of *Macrosporium*, *Fusarium*, and *Sclerotinia* uniformly succumb to much lower temperatures in a shorter time. Practical control of *Phoma* [*betae*] has been demonstrated by this method, the value of which against *S.* [*sclerotiorum*] on cabbage was also shown by preliminary experiments.

WESTERN (J. H.). **Seed-borne fungi.**—*Nature, Lond.*, clv, 3924, pp. 36–37, 1945.

At a meeting of the British Mycological Society on 28th October, 1944, Dr. Mary Noble read a paper on blind seed disease (*Phialea temulenta*) of rye grass (*Lolium* spp.) [see above, p. 151], in which the identity of the fungus was discussed and reference made to the control of the disease by storing the seed until the organism has died out. Miss K. Sampson dealt with the endophytes of *Lolium* [*R.A.M.*, xxii, p. 138]. Dealing with broccoli canker (*Phoma lingam*) in the West Riding of

Yorkshire, where many farmers use their own seed, Dr. W. A. Millard stated that for some years he has accepted seed stocks from growers and cleansed them by immersion for 25 minutes in water at 50° C. Stocks are cleaned and propagated and handed back to the growers in a perfectly healthy condition. A case of seed-borne club root of swede (*Plasmodiophora brassicae*) was described by Dr. L. G. G. Warne, who was able to infect a clean sample of seed with washings from an infected one. Dr. A. Smith gave an account of seed examination as carried out at the Pathology Laboratory of the Ministry of Agriculture and Fisheries, Harpenden. Over 4,000 samples were examined in the year 1939–40. The main causes of rejection were *Ascochyta* [*pisi*] in peas, *Septoria* in celery [*S. apii-graveolentis* and *S. apii*] and parsley [*S. petroselini*], and halo blight (*Pseudomonas* [*medicaginis* var.] *phaseolicola*) in dwarf beans. The presence of *Ascochyta* in seed peas accounted for the rejection of 23 per cent. of all peas examined for export between 1925 and 1943. In the same period, 23 per cent. of all samples of celery seed and 31 per cent. of parsley were refused certificates because of the presence of *Septoria*. In recent years, the rejections for halo blight of beans have varied from 5 to 25 per cent. A sample of onion seed showed the presence of *Botrytis allii*. Dr. G. C. Ainsworth dealt with legislation in relation to seed-borne diseases and demonstrated the world distribution of certain seed-borne fungi with the help of maps [ibid., xxiv, p. 128].

Haddon (E.). **Notes on the importance of moulds.**—*Rev. agric. Maurice*, xxiii, 5, pp. 194–196, 1944.

The available information concerning the industrial production of citric acid and citrate of lime through the fermentation of sucrose by different moulds [*R.A.M.*, xiv, pp. 52, 604] is summarized.

Wilkins (W. H.) & Harris (G. C. M.). **Investigation into the production of bacteriostatic substances by fungi. VI. Examination of the larger Basidiomycetes.**—*Ann. appl. Biol.*, xxxi, 4, pp. 261–270, 1944 [1945].

Continuing their earlier studies [*R.A.M.*, xxiii, p. 308], the authors tested some 700 species of the larger Basidiomycetes for bacteriostatic properties. The results indicate that these fungi are among the most promising groups that produce antibiotics, comparing favourably in this respect with *Aspergillus* and *Penicillium*. Of the species tested, about 70 were strongly, and about 100 weakly positive against *Staphylococcus aureus* and/or *Bacterium coli*.

Batson (D. M.), Teunisson (Dorothea J.), & Porges (N.). **Study of a soil-burial method of determining rot resistance of fabrics.**—*Amer. Dyest. Reptr*, xxxiii, 21, pp. 423–427, 22, pp. 449–454, 3 graphs, 1944.

A review is given of the literature dealing with the mildewing and rotting of fabrics, and with methods of testing the resistance of such materials to microbial invasion. Various disadvantages were found to be inherent in the standard soil burial method of evaluation [*R.A.M.*, xxii, p. 359], and an attempt was therefore made, at the Southern Regional Research Laboratory, New Orleans, to devise a more suitable procedure. The tests were carried out in covered outdoor beds, using a soil mixture of equal volumes of coarse sand, clay loam, and well-rotted manure, a 9- to 10-in.-deep layer of which was maintained at a moisture content near 28 per cent. and a temperature of 85° to 90° F. Untreated and rot-proofed 6½-oz. cotton osnaburg and 8½-oz. jute burlap were tested, the treated fabrics containing 10 per cent. by weight of copper naphthenate (equivalent to 1 per cent. copper) [ibid., xxiii, p. 266]. Strips 9 by 1½ to 2 in. were buried vertically to a depth of 7 in., and five of each sample were removed at frequent intervals for breaking-strength measurements.

The period of burial required for complete decay of both the untreated materials

was six to eight days, whereas the impregnated strips of osnaburg and jute resisted disorganization for roughly 7 and 17 times longer, respectively. In preliminary tests on cotton osnaburg in an indoor bed, horizontally buried strips lost breaking strength at about the same rate at varying depths below 1 in. but more slowly at ¼ in. At or below 1 in. the strips were completely rotted in six days at a soil temperature of 86±2° and in eight at 75±4°. Strips buried vertically in trenches rotted uniformly at varying depths, while those pushed down with a metal blade decayed most rapidly in the lower portions.

On the basis of these results it is recommended that (*a*) an 85 per cent. loss in breaking strength be considered as the practical end point of fabric-rotting, and (*b*) the rot resistance of a fabric be expressed as the ratio between the number of days' burial required to cause such a loss in any given fabric and the number of days necessary for a comparable effect to develop in copper naphthalene-treated specimens of the same fabric containing 1 per cent. copper.

Tweedie (Audrey S.) & Bayley (C. H.). **The preservation of cordage.**—*Canad. Text. J.*, lxi, 13, pp. 31–32, 34, 38, 1 fig., 1944.

Copper naphthenate [see preceding abstract], applied to manila, sisal, cotton, 'wartime', and hemp ropes, ⅜ in. in diameter, gave highly satisfactory control of microbiological deterioration, as gauged by the soil-burial test, preceded by 24 hours' leaching in running water at 20° C. In the treated samples the maximum loss in breaking strength was 12 per cent. (in manila), compared with 65 to 94 per cent. for the untreated exposed to comparable conditions. The relevant specification in the Schedule of Methods of Testing Textiles of the Canadian Government Purchasing Standards Committee [*R.A.M.*, xxiii, p. 184] requires the presence in the treated rope of a minimum of 0·5 per cent. copper. In these experiments the amounts actually found at the end of the soil-burial period were 0·38, 0·41, 0·47, 0·53, and 0·66 per cent. for sisal, manila, 'wartime', cotton, and hemp, respectively, but since adequate protection was conferred even on the harder fibres, with their lower absorptive properties, a copper content of roughly 0·2 per cent. may be regarded as sufficient. However, in order to conform to the official regulations and leave a margin of safety against loss through weathering, the copper content of the preservative should be adjusted to the capacity for intake of a given fibre.

Hirschmann (Doris J.), Zametkin (Marian), & Rogers (Ruth E.). **The utilization of wool by four saprophytic micro-organisms in the presence of additional nutrients.**—*Amer. Dyest. Reptr*, xxxiii, 17, pp. 353–359, 2 figs., 1944.

The growth of *Bacillus mesentericus*, *B. subtilis*, *Actinomyces albus*, and *Chaetomium globosum* was studied in the presence and absence of de-greased, sterilized wool fabric on Czapek's liquid medium and the same with the omission of sucrose or sodium nitrate or both. The same media were used in the solid form by the addition of agar. The effect of incorporating an aqueous wool extract with the different liquid media was also investigated.

The best growth was made on the complete Czapek's solution or agar, development on the modified synthetic substrata being less abundant and on the water agar absent or scanty to fair, while *C. globosum* was the only one of the organisms capable of existing on distilled water. All grew, however, in the last-named with the addition of wool fabric or extract, which also exerted a stimulatory action on the development of saprophytes in the other media. Wool in distilled water without added nutrients was attacked only by *C. globosum*, and that to a limited extent. *C. albus* was the most active of the saprophytes in the disintegration of wool fibre on all the substrata except distilled water.

Wool fibre would appear from these experimental data to be relatively resistant

to the organisms under observation, which readily utilized, however, the soluble products arising from the hydrolysis of the material.

Fulton (C. O.), Gibbons (N. E.), & Moore (R. L.). **The fungicidal effect of vegetable-tanned leather and various disinfectants on Trichophyton gypseum and T. interdigitale.**—*Canad. J. Res.*, Sect. F, xxii, 6, pp. 163–168, 1 pl., 1944.

An investigation into methods of disinfecting old shoes that are to be re-conditioned and re-worn showed that new, vegetable-tanned, fat-liquored leather had a fungicidal effect on one strain of *Trichophyton gypseum* and two of *T. interdigitale* tested, but not on several strains of common mould contaminants, including *Aspergillus fumigatus*, *A. flavus*, *Rhizopus nigricans* [*R. stolonifer*], and an unidentified species of *Alternaria*. Chrome-tanned leather, vegetable-tanned leather from an old shoe, and vegetable-tanned leather leached overnight in running water did not show fungistatic or fungicidal properties.

Of various disinfectants tested under conditions resembling those of the fat-liquoring operation, the most effective was phenylmercuric acetate, which destroyed *T. gypseum* in 18 hours at a concentration of 1 in 100,000, a dilution of 1 in 1,000 being required to produce the same effect in the same time when commercial formalin or dihexylin was used. Leather treated with phenylmercuric acetate at 1 in 100,000 would be unlikely to cause skin injury.

Platon (B.) & Thomé (K. E.). **Försök rörande bekämpning av ostmögel genom bestralning med sterilamps.** [Experiments in the control of cheese moulds by irradiation with 'sterilamps'.]—*Medd. Meijeriförs., Alnarp*, 10, 1942. [Swedish, with English summary. Abs. in *Zbl. Bakt.*, Abt. 2, cvi, 13–15, pp. 309–310, 1944.]

Details are given of laboratory and storeroom experiments in the control of cheese moulds (*Penicillium glaucum*, *Aspergillus niger*, *A. glaucus*, *A. candidus*, *Mucor hiemalis*, *Oospora lactis*, *Stemphylium* sp., and *Torulopsis* sp.) by irradiation with ultra-violet 'sterilamps' 80 cm. in length from a distance of 50 to 150 cm. After four weeks' exposure in the refining room, all the irradiated cheeses were practically mould-free, whereas two-thirds of the untreated were infected, the corresponding figures after five weeks being 95 and 90 per cent., respectively; at the end of six weeks one-third of the irradiated cheeses were still sound, while the untreated were all mouldy, and even after two months only nine out of 300 in the treated lot were found to harbour mycelia. Since the moulds continue to grow under a layer of paraffin even on irradiated cheese, it is very important to remove all trace of them before applying the wax.

Summary of the papers presented at the plant quarantine session.—*Phytopathology*, xxxiv, 11, pp. 994–996, 1944.

The first annual meeting of the Potomac Division of the American Phytopathological Society, which took place at the Bureau of Plant Industry Station, Beltsville, Maryland, on 23rd and 24th February, 1944, included a session on plant quarantine problems. W. A. McCubbin gave an introductory review of the situation in the United States, with special reference to national planning for the organization of foreign plant disease exclusion measures [*R.A.M.*, xxiv, p. 89]; H. P. Barss discussed the application of quarantine regulations to the protection of basic national crops; N. R. Hunt emphasized the urgency of the study of foreign diseases, having regard to the likelihood of their spread under war-time conditions; L. M. Hutchins drew attention to the difficulties involved in the prevention of foreign virus disease introduction; and R. K. Beattie urged the advisability of detention procedures to guard against the deferred development of dormant infections.